

From: Whittaker, Laura [laura.whittaker@aptim.com]
Sent: Thursday, August 16, 2018 2:11 PM
To: Liscio, Matthew P CIV SEA 04, NAVSEA DET RASO [matthew.liscio@navy.mil]
CC: Slack, Matthew L CIV SEA 04 04N [matthew.slack@navy.mil]; Howard, Leslie A CIV NAVFAC SW [leslie.howard@navy.mil]; Noble, Kimberly K CIV SEA 04, NAVSEA DET RASO [kimberly.k.noble1@navy.mil]; Johnson, Nels [Nels.Johnson@aptim.com]; Schul, Raymond [raymond.schul@aptim.com]; Guillory, Jeffrey [jeffrey.guillory@aptim.com]; Meldrum, Amy [amy.meldrum@aptim.com]; Hanelt, Norm [Norm.Hanelt@aptim.com]; Killpack, Randall [randall.killpack@aptim.com]; Gerg, David [david.erg@aptim.com]; Chi, Minhsec [minhsec.chi@aptim.com]; Orman, Sean [sean.orman@aptim.com]; Rogers, Bryon [bryon.rogers@aptim.com]
Subject: [Non-DoD Source] Data package ready for review - HPNS PE-2, RSY C7 (Use 12)
Attachments: HPNS APTIM RSY C7 (Use 12) Soil Non-LLRW Concurrence Request 08162018 (reduced).pdf

Mr. Liscio,

APTIM request RASO concurrence to designate this soil as Non-LLRW soil.

If there are any questions or if additional data is required, please contact me.

Thank you.



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APTIM
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200 Fisher Avenue
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Hunters Point Naval Shipyard, Parcel E-2 RSY Data Report

Contract No. EMAC III CTO-0013						
RSY Pad: C7	RSY Pad Use Number: USE 12	First Submittal <input checked="" type="checkbox"/>	Second Submittal <input type="checkbox"/>			
Data attached and submitted by: Laura Whittaker		Data Report Submittal Date: 08/16/2018				

Soil Sample Data						
Sample Identification	Survey Location	Type of Sample	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁶⁰ Co Final Analytical Results (pCi/g)	Total Sr Final Analytical Results (pCi/g)
		Upper limit of site reference background	1.633	0.113	0.252	0.331
PE2-RSYC7-U12-S001	1	Systematic	0.444	-0.0155	0.0271	0.0134
PE2-RSYC7-U12-S002	2	Systematic	0.539	0.0392	0.0296	N/A
PE2-RSYC7-U12-S003	3	Systematic	0.340	-0.0459	0.00955	N/A
PE2-RSYC7-U12-S004	4	Systematic	0.576	0.0275	0.0190	N/A
PE2-RSYC7-U12-S005	5	Systematic	0.498	-0.0409	-0.00976	N/A
PE2-RSYC7-U12-S006	6	Systematic	0.407	-0.00332	0.0395	N/A
PE2-RSYC7-U12-S007	7	Systematic	0.599	0.0209	0.0124	N/A
PE2-RSYC7-U12-S008	8	Systematic	0.488	-0.0281	-0.0125	N/A
PE2-RSYC7-U12-S009	9	Systematic	0.589	-0.0181	0.0181	N/A
PE2-RSYC7-U12-S010	10	Systematic	0.464	0.000	0.00393	N/A
PE2-RSYC7-U12-S011	11	Systematic	0.418	0.0541	0.0131	0.0555
PE2-RSYC7-U12-S012	12	Systematic	0.507	-0.0449	0.00695	N/A
PE2-RSYC7-U12-S013	13	Systematic	0.599	-0.0320	0.0185	N/A
PE2-RSYC7-U12-S014	14	Systematic	0.415	0.0182	0.00771	N/A
PE2-RSYC7-U12-S015	15	Systematic	0.654	0.00184	0.0587	N/A
PE2-RSYC7-U12-S016	16	Systematic	0.539	0.00212	0.0412	N/A
PE2-RSYC7-U12-S017	17	Systematic	0.599	-0.0476	0.0278	N/A
PE2-RSYC7-U12-S018	18	Systematic	0.349	0.0188	0.00261	N/A

¹³⁷Cs Cesium-137
⁶⁰Co Cobalt-60
²²⁶Ra Radium-226
Sr Strontium
pCi/g Picocuries per gram

Instrument and Survey Data										
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #	Reference Area Static Bkgd	Reference Area Static 3σ IL	Reference Area Scan Bkgd	Reference Area Scan 3σ IL	Range
RSI Gamma Walkover Survey	HPRS-07032018-PE2-ROV2-2699	07/03/2018	RS-701/RSX-1	N/A	Console: 7236 Detectors: 5447,5448	N/A	N/A	3,400 CPS	4,872 CPS	2,947-3,595 CPS
RSI Follow-up Static Survey	HPRS-07092018-PE2-JSS2-2728	07/09/2018	RS-701/RSX-1	N/A	Console: 7236 Detectors: 5447,5448	3,612 CPS	4,255 CPS	N/A	N/A	3,103-3,634 CPS
Systematic Sample Survey	HPRS-07022018-PE2-JSS-2697	07/02/2018	2221	07/12/2018	271439	15,783 CPM	18,714 CPM	N/A	N/A	13,202-14,316 CPM

3σ IL Investigation Level (established at 3σ above the mean of the Reference Area dataset)

CPS Counts per second

CPM Counts per minute

Summary
1) RSI gamma walkover survey and data review—upon review of initial scan data, follow-up static investigations were deemed necessary, and investigation locations were identified as per the RSI Data Evaluation Process (pages 3-4). Gamma scan coverage is shown on the Systematic Sample Survey map (page 8). Contour maps of scan data are shown on RSI Data Plots (page 5). Data review results are summarized on RSI Review Summary (page 6).
2) RSI Follow-up static survey—22 locations identified during the data review process were investigated, with readings less than the Reference Area static IL at all locations for regions of interest (ROIs) 3, 6, 7, 8, and 9 (VD1). Follow-up locations are shown on the RSI Follow-up Static Survey map (page 7).
3) Eighteen systematic soil samples (001-018) were obtained and submitted for gamma spectroscopy analysis. Sample locations for systematic samples are shown on the Systematic Sample Survey map (page 8). TestAmerica sample results are attached (pages 34-57). Ten percent of the systematic soil samples (two samples in total, PE2-RSYC7-U12-S001 & PE2-RSYC7-U12-S011) were also analyzed for total strontium. Total Strontium results are also included in the TestAmerica sample results report (pages 34-57).
Conclusions: All locations with elevated Z-scores identified by the RSI gamma walkover survey were determined to be consistent with background. 22 locations were investigated during the follow-up static survey, with readings less than the Reference Area static IL at all locations for ROIs 3, 6, 7, 8, and 9 (VD1). Spectral analysis results and gamma static data for each region of interest (ROI) are provided (pages 9-30). Final analytical results for systematic samples from this RSY pad are concluded to be comparable to background. Histograms showing soil sample activity concentrations are provided (pages 31-33). Ten percent of the systematic soil samples (two samples in total, PE2-RSYC7-U12-S001 & PE2-RSYC7-U12-S011) were also analyzed for total strontium, with concentrations less than the Project Action Limit of 0.331 pCi/g, as shown in the Soil Sample Data table (page 1). RSY C7 (Use 12) contains soil from Survey Unit areas undergoing revetment construction. APTIM request RASO concurrence to release this soil as Non-LLRW. Disposition: This soil shall be dispositioned as non-LLRW waste to be stockpiled onsite following appropriate chemical characterization.

RSI Data Evaluation Process

RS-700 Mobile Radiation Monitoring System

- Self-contained gamma-ray radiation detection and monitoring system
- (2) RSX-1 4-liter NaI(Tl) gamma detectors oriented perpendicular to the direction of travel (VD1 denotes both detectors summed; VD3 refers to the left detector; and VD4 refers to the right detector)
- Multi-Channel Analyzer, allowing for monitoring of energy-specific regions of interest (ROIs)
- RadAssist survey software for control, monitoring, and recording

Ten ROIs have been established for radium and progeny, cesium, and cobalt, as well as other naturally-occurring or anthropogenic gamma-emitting radionuclides that may be of interest:

ROI	Description	Energy Range (keV)	Primary Peak (keV)
1	Total counts	411 – 2811	N/A
2	Potassium	1371 – 1569	1460
3	U/Ra-226	1659 – 1860	1764 (Bi-214)
4	Thorium	2409 – 2811	2614 (Tl-208)
5	Annihilation	456 – 570	511
6	Ra-226	546 – 666	609 (Bi-214)
7	Cs-137	600 - 720	662
8	Pb-214/Ra-226	327 – 399	351
9	Co-60	1085 - 1370	1173/1332
10	Gross Counts	24 – 2811	N/A

A tiered approach is used during data review to identify follow-up locations. Raw data are exported to a comma delimited format using RadAssist and imported into an Excel spreadsheet for review and analysis. The following review steps are completed to determine if additional follow-up measurements are necessary:

- **Playback Review:** The data file is replayed in RadAssist and reviewed for elevated count rates in ROIs 6, 7, 9, and 10 for virtual detector (VD) 1 (both detectors summed). The scan screen is also monitored for elevated count rates and alarms.
- **Count Rate Time Series Review:** The count rates for ROIs 6, 7, 9, and 10 for VDs 1, 3 (detector 1), and 4 (detector 2) are plotted in a time series and reviewed for additional peaks in count rate.
- **All ROIs:**
 - **Z-Scores:** The Z-Scores are calculated for each location in all ROIs for VDs 1, 3, and 4. Any location with four or more ROIs having a Z-Score greater than three ($Z>3$) is marked for follow-up.
 - **Local Z-Scores:** Local Z-Scores are calculated using a moving average for each data point in all ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with four or more ROIs having a local $Z>3$ is marked for follow-up.
 - **Semi-local Z-Scores:** Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with four or more ROIs having a semi-local $Z>3$ is marked for follow-up.
- **ROIs 3, 6, 8, and 10 (radium-specific ROIs):**
 - Z-Scores: The Z-Scores are calculated for each location in the radium-specific ROIs for VDs 1, 3, and 4. Any location with three or more radium-specific ROIs having a $Z>3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in the radium-specific ROIs for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a local $Z>3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise

be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) with three or more radium-specific ROIs having a semi-local $Z > 3$ is marked for follow-up.

- **ROI 7 (cesium-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 7 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 7 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 7 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **ROI 9 (cobalt-specific ROI):**
 - Z-Scores: Z-Scores are calculated for each location in ROI 9 for VDs 1, 3, and 4. Any location having a $Z > 3$ is marked for follow-up.
 - Local Z-Scores: Local Z-Scores are calculated using a moving average for each data point in ROI 9 for VDs 1, 3, and 4 to identify elevated count rates where the background is variable (e.g. multiple surface types). Any location (in a survey unit that meets this condition) having a local $Z > 3$ is marked for follow-up.
 - Semi-local Z-Scores: Semi-local Z-Scores are calculated using the global average, but with a moving average for the standard deviation in ROI 9 for VDs 1, 3, and 4. This is used for survey data that have a consistent background but an area or areas of highly elevated count rates, in order to identify smaller areas of elevated count rates that may not otherwise be identified by the initial Z-score review. Any location (in a survey unit that meets this condition) having a semi-local $Z > 3$ is marked for follow-up.
- **Z-Score Time Series Review:** The three types of Z-Scores for ROIs 6, 7, 9, and 10 for VDs 1, 3, and 4 are plotted in a time series and reviewed for additional peaks in Z-Scores.

Any location selected for follow-up or with a Z-Score > 3 in a radium-, cesium-, or cobalt-specific ROI will undergo spectral analysis to determine if it is statistically likely that there are ROC concentrations present at that location in quantities greater than background.

A background spectrum is subtracted from the local spectral data for a given location, and the resulting net spectrum is plotted. Critical levels, as defined in Section 6.7.1 of the Multi Agency Radiation Survey and Site Investigation Manual are calculated and plotted based on background levels. The critical level is the level, in counts, at which there is a statistical probability (with a predetermined confidence) of incorrectly identifying a measurement system background value as greater than background. Any response above this level is considered to be greater than background. The critical level is calculated for ROIs 6, 7, 8, and 9 according to the equation shown below:

Where:

$$L_C = 2.33\sqrt{B}$$

LC	=	critical level (counts)
B	=	average background in the ROI

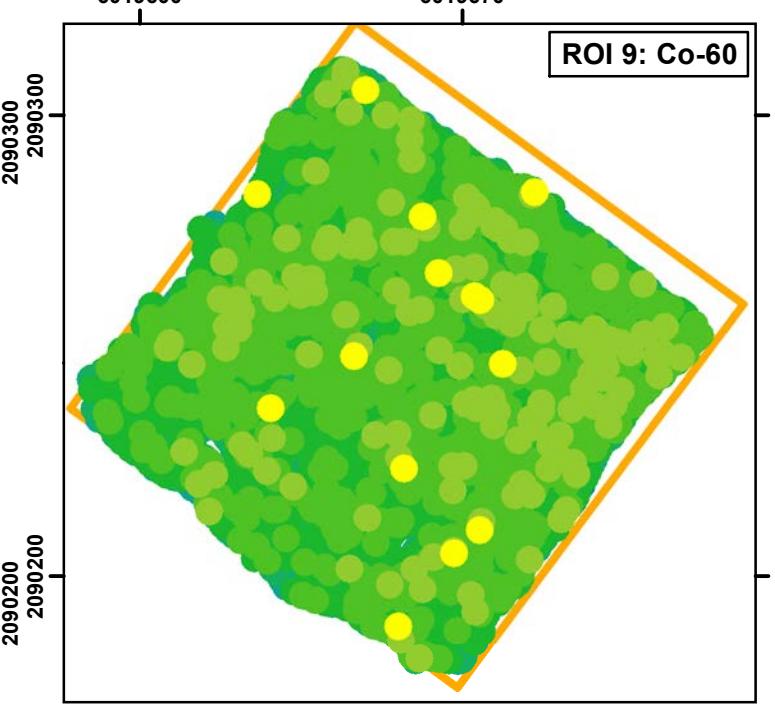
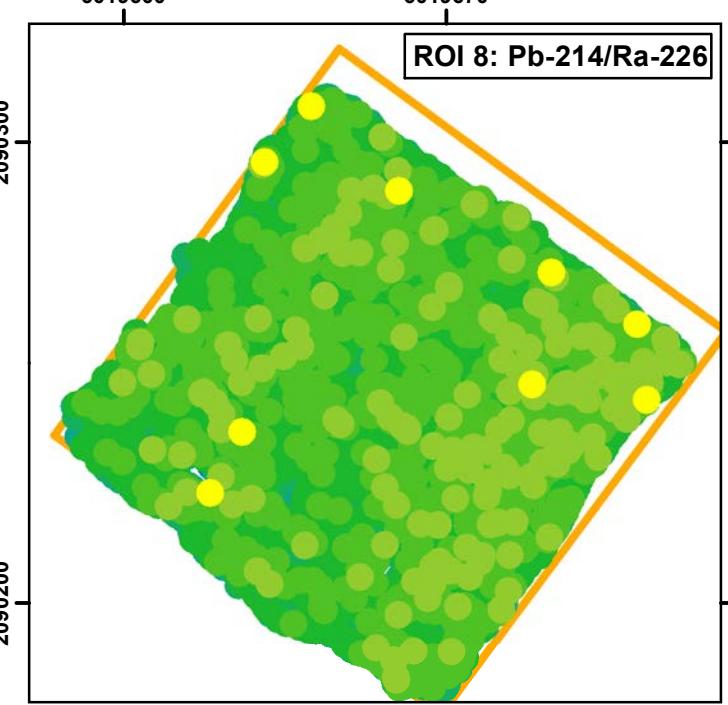
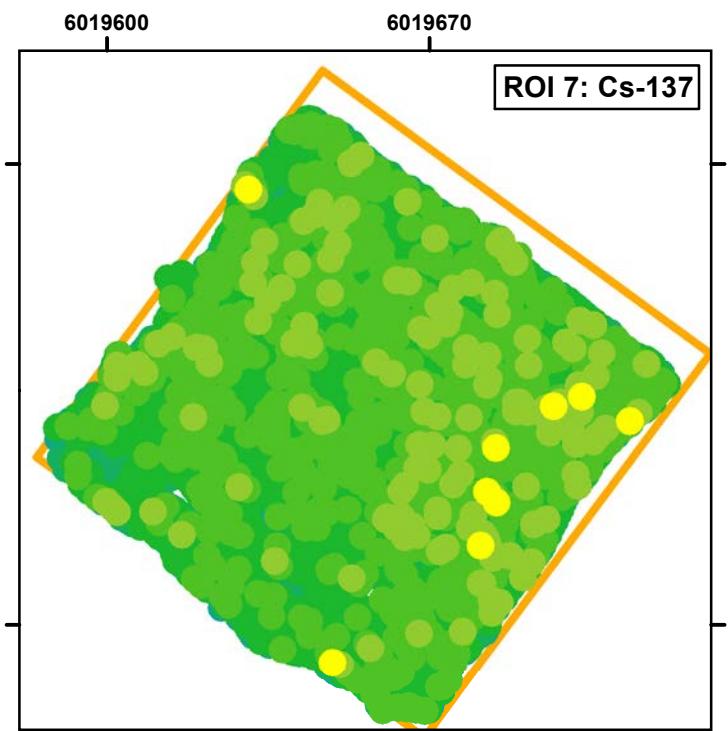
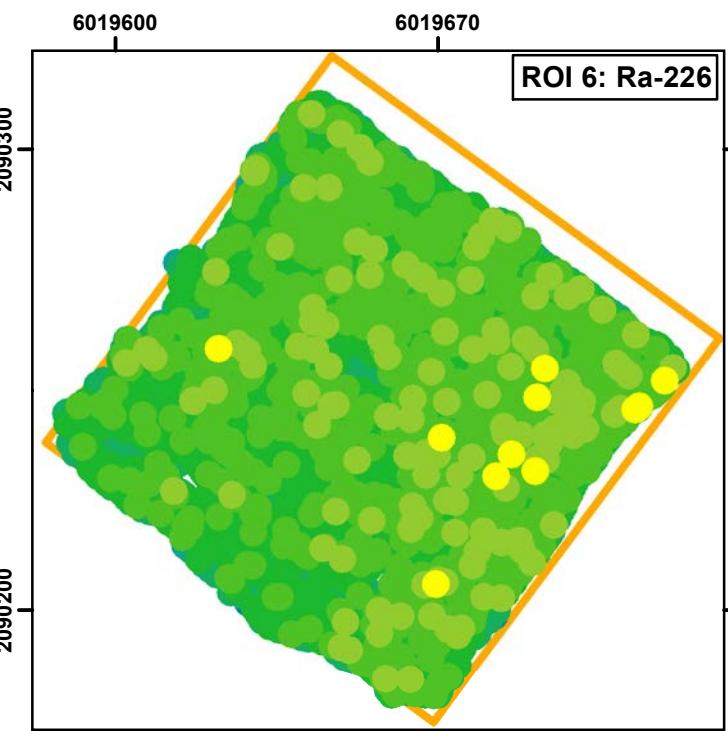
When count rates in the net gamma spectrum at a given location do not exceed critical levels for any radium-, cesium-, or cobalt-specific energy ranges, it is unlikely that ROC concentrations exist at that location above background.

Any data point that is both above the critical level and within the energy range of a given ROI is considered above background for that radionuclide and will be flagged for further investigation in the field.

**HPNS Parcel E-2
RSY Pad C7 (Use 12)**

Contour Map

Page 5 of 57
Soil Excavation Site:
Revetment Spoils



RS 700 Gamma Walkover Survey Data (VD1)

- | | |
|----------------------------------------|-----------------------------------|
| Yellow circle: > 3 std dev | Green circle: > -1 to < 0 std dev |
| Light green circle: > 2 to < 3 std dev | Cyan circle: > -2 to < -1 std dev |
| Dark green circle: > 1 to < 2 std dev | Blue circle: > -3 to < -2 std dev |
| Dark green circle: > 0 to < 1 std dev | Dark blue circle: < -3 std dev |
- Orange rectangle: RSY Pad Boundaries

0 15 30 60 Feet

Coordinate system: CSP Zone III. NAD83, US Survey Foot



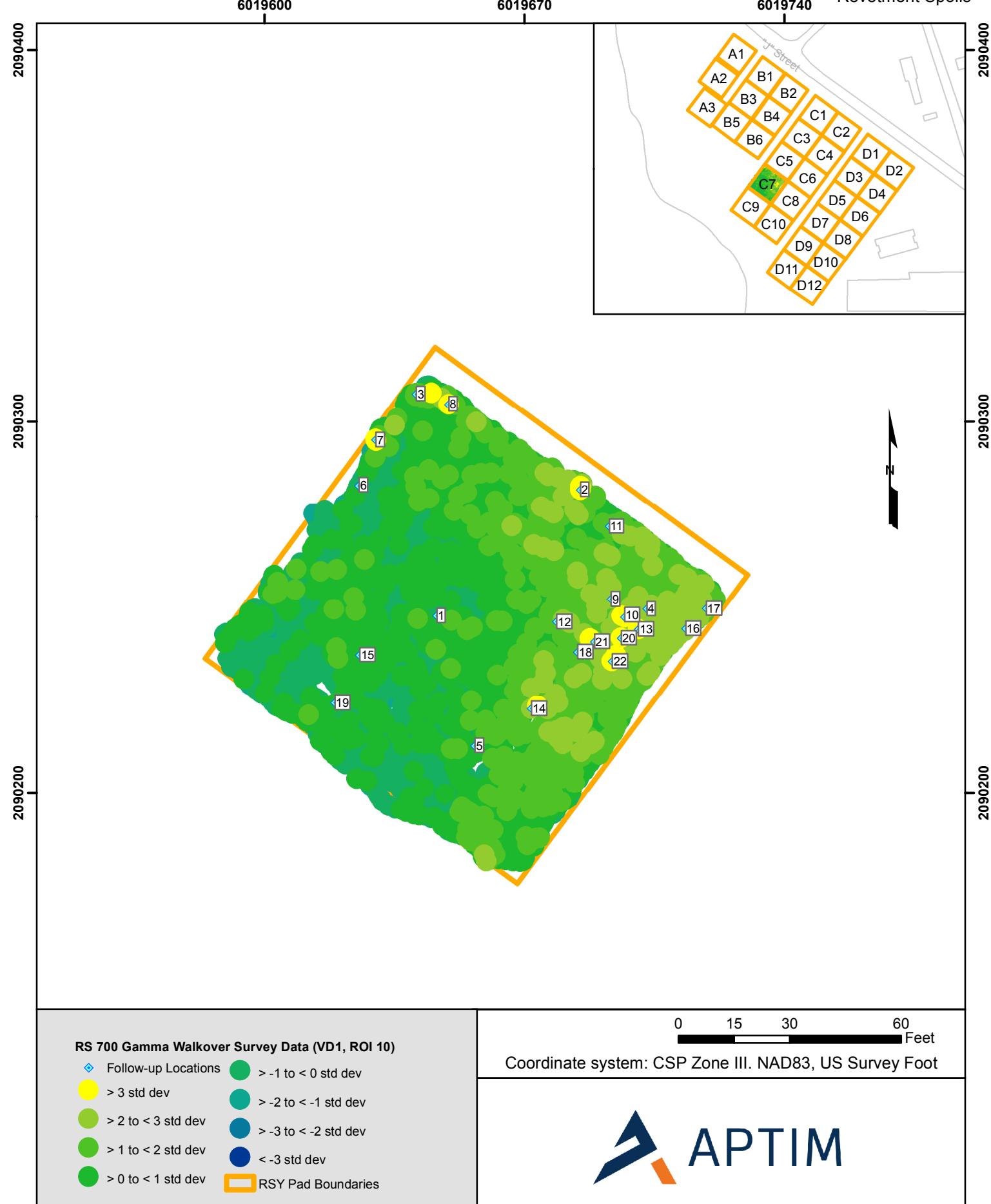
RSI Review Summary

Summary:

22 locations were initially selected for follow-up investigation. Locations were identified by elevated peaks noted in the playback review and/or time series charts, and by using the Z-Score, Local Z-Score, and Semi-Local Z-Score reviews as described in the RSI Data Evaluation Process on pages 3-4. Spectral analyses performed on gamma static data at these locations do not indicate the presence of ^{226}Ra , ^{137}Cs , or ^{60}Co above background. Gamma static readings at these locations are less than the Reference Area static IL for ROIs 3, 6, 7, 8, and 9; figures are provided on pages 9-30.

HPNS Parcel E-2
RSY Pad C7 (Use 12)

Soil Excavation Site:
Revetment Spoils



RS 700 Gamma Walkover Survey Data (VD1, ROI 10)

- Follow-up Locations
 - > 3 std dev
 - > 2 to < 3 std dev
 - > 1 to < 2 std dev
 - > 0 to < 1 std dev
 - > -1 to < 0 std dev
 - > -2 to < -1 std dev
 - > -3 to < -2 std dev
 - < -3 std dev
- RSY Pad Boundaries

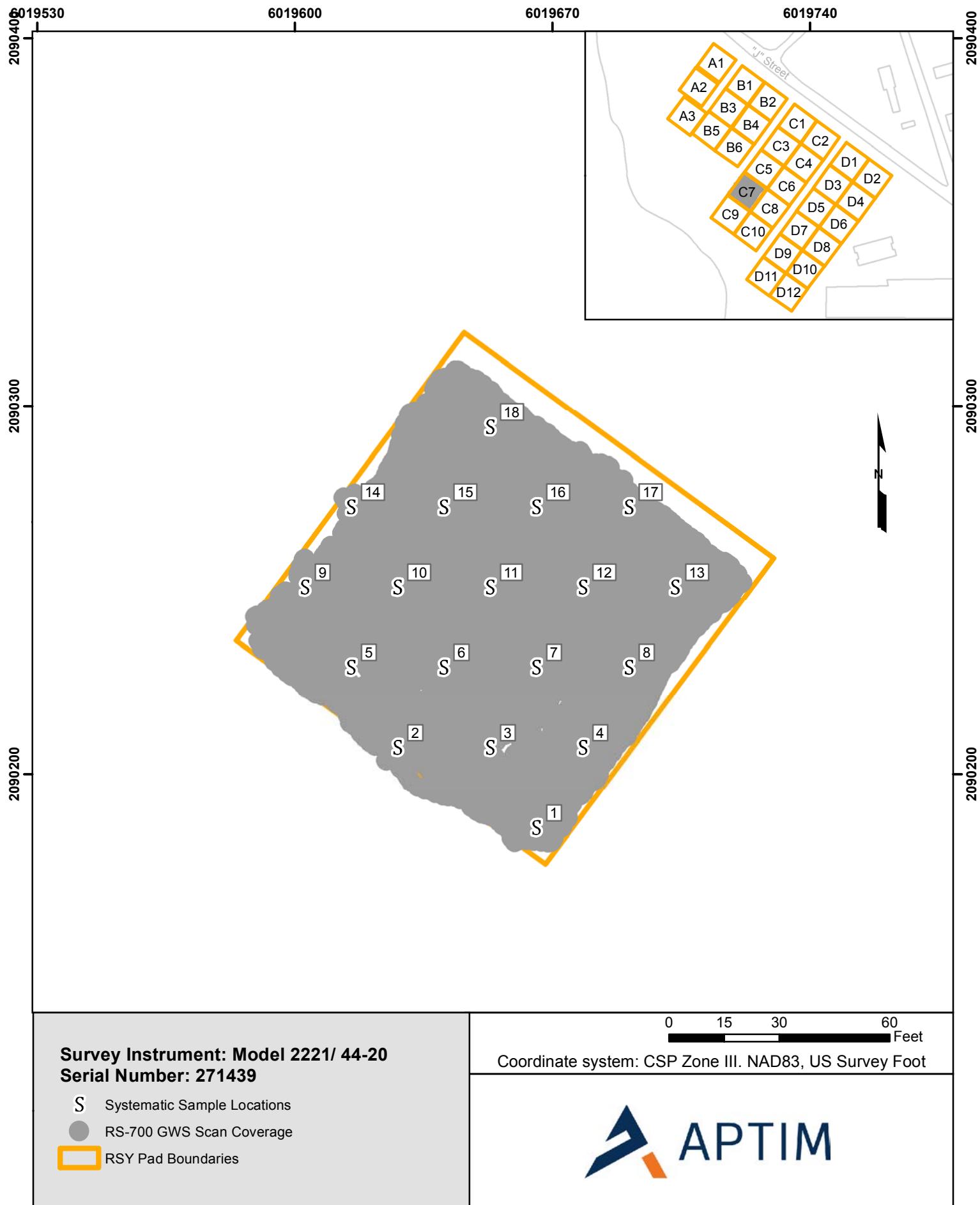
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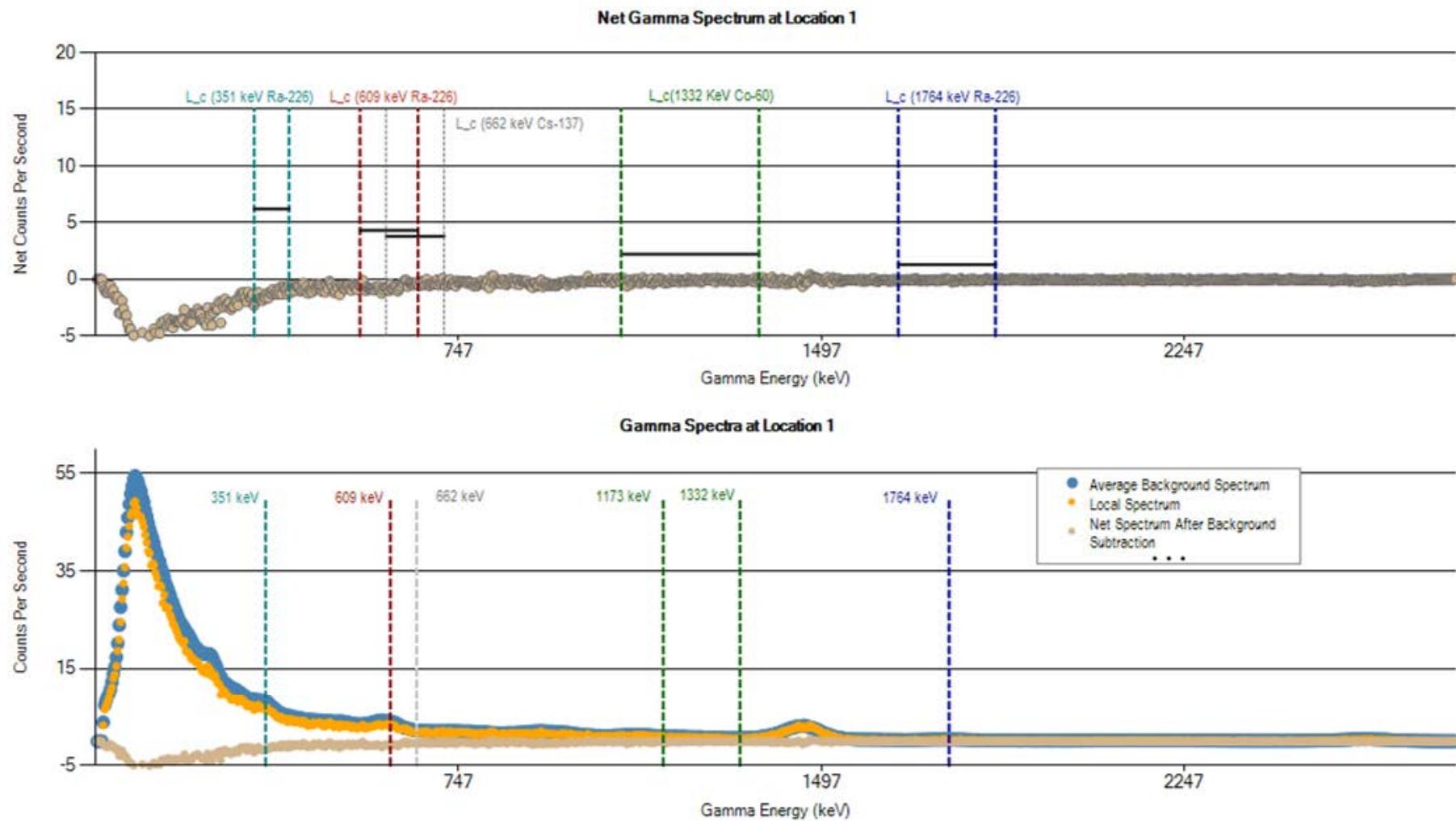


Systematic Sample Survey
HPRS-07022018-PE2-JSS-2697

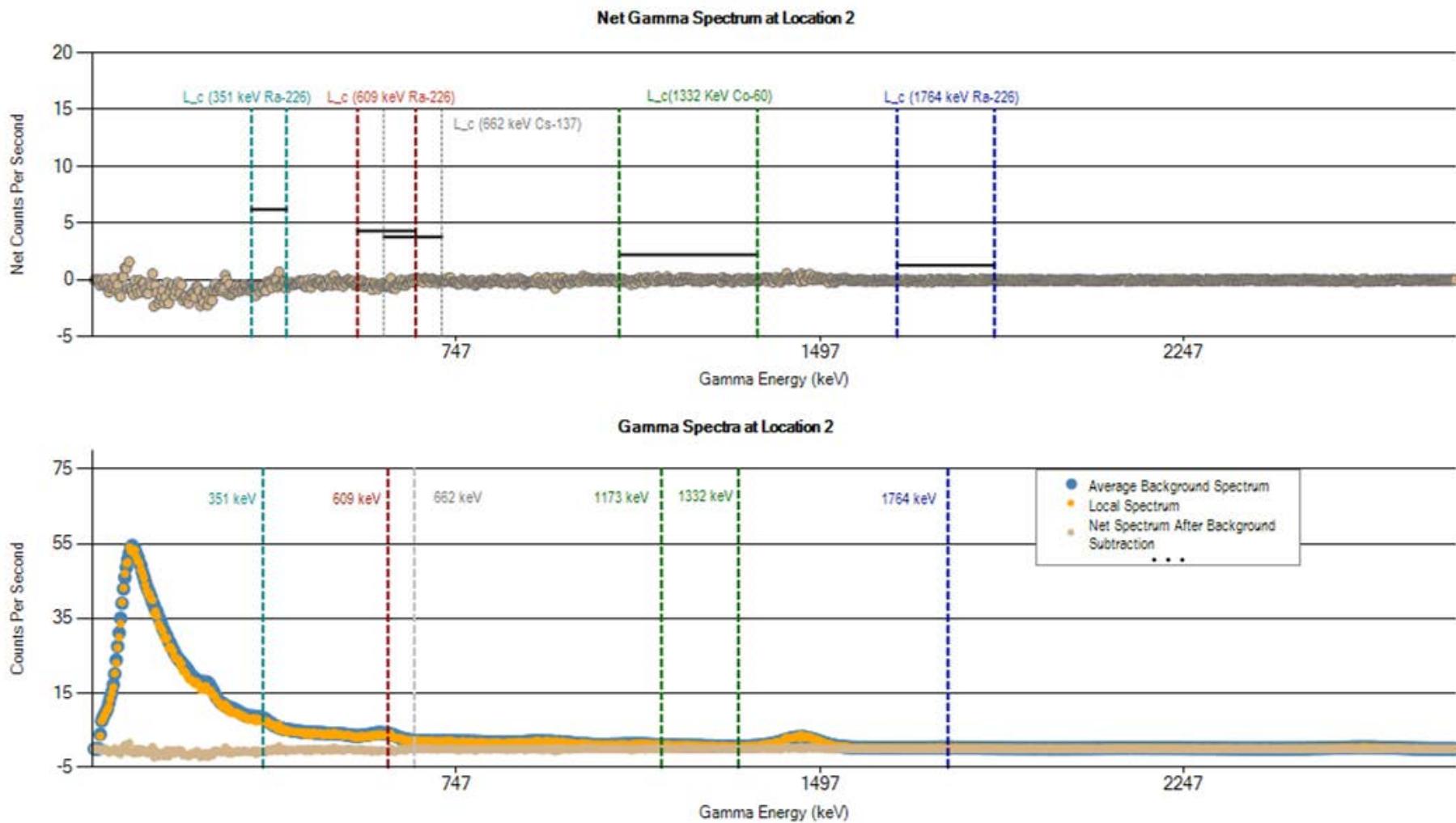
HPNS Parcel E-2 RSY Pad C7 (Use 12)

Soil Excavation Site:
Revetment Spoils

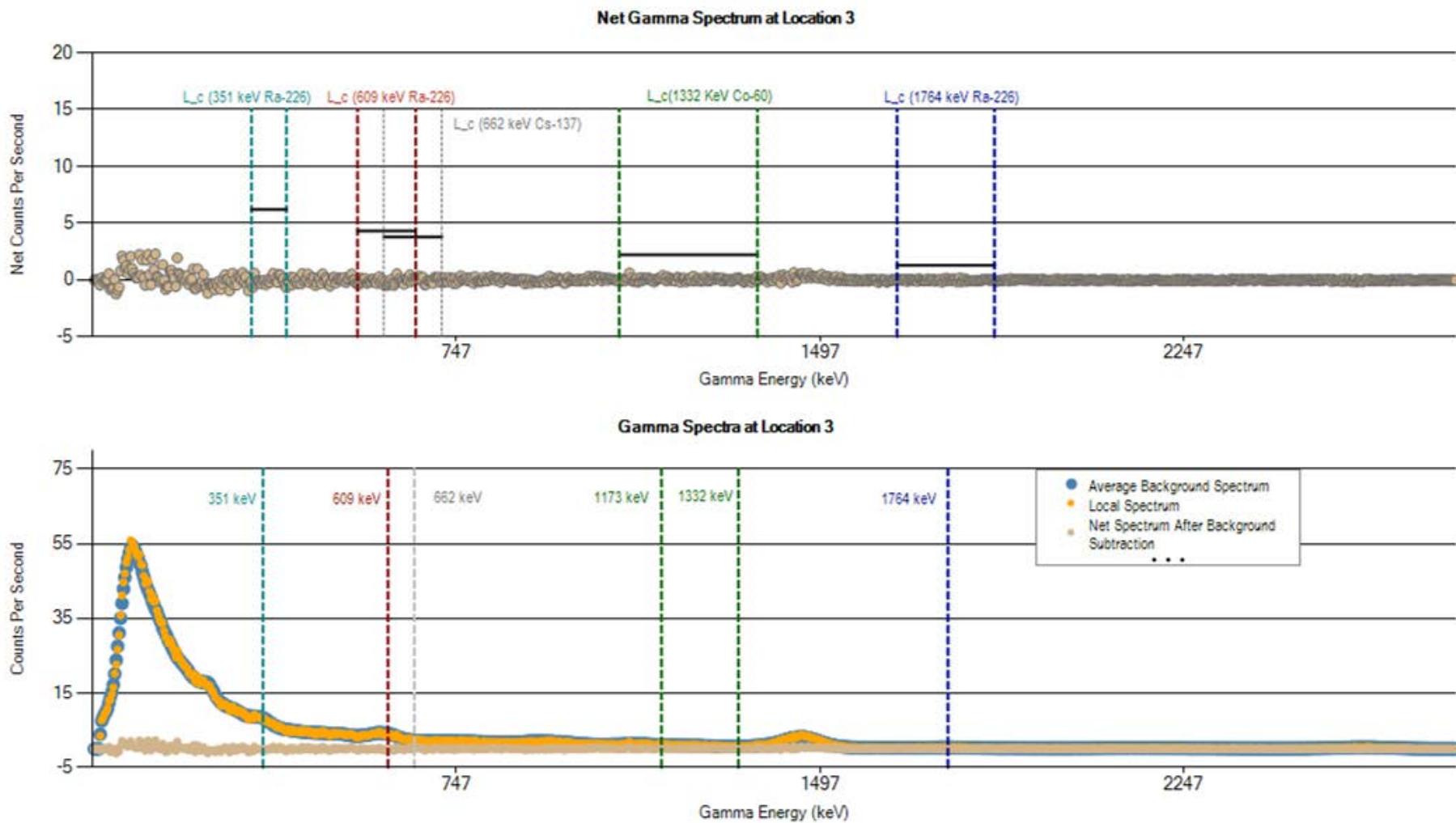




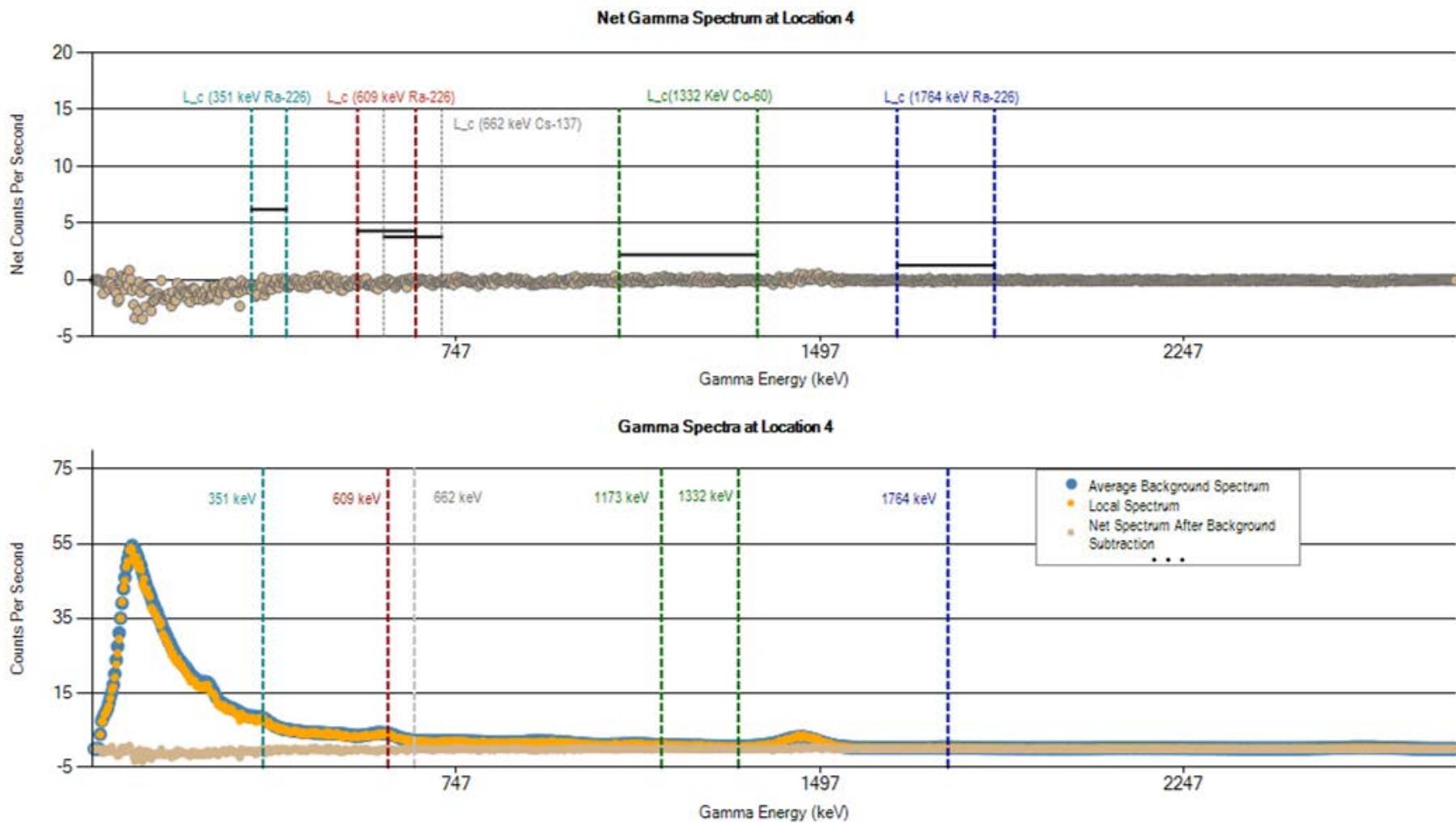
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Location 1 (cps)	718	109	16	17	123	114	89	142	77	3103
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



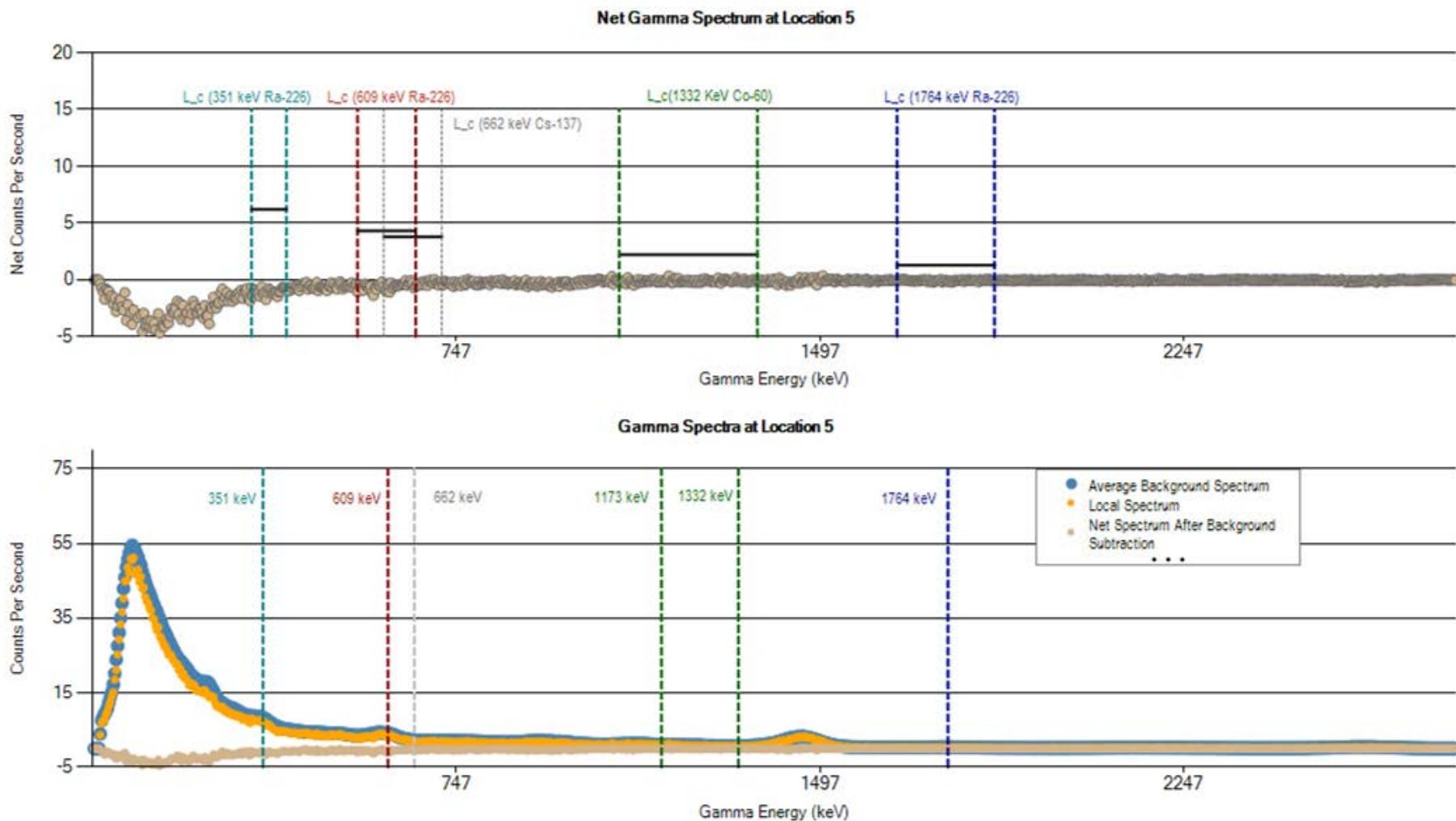
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Location 2 (cps)	810	120	17	21	142	126	100	163	88	3467
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



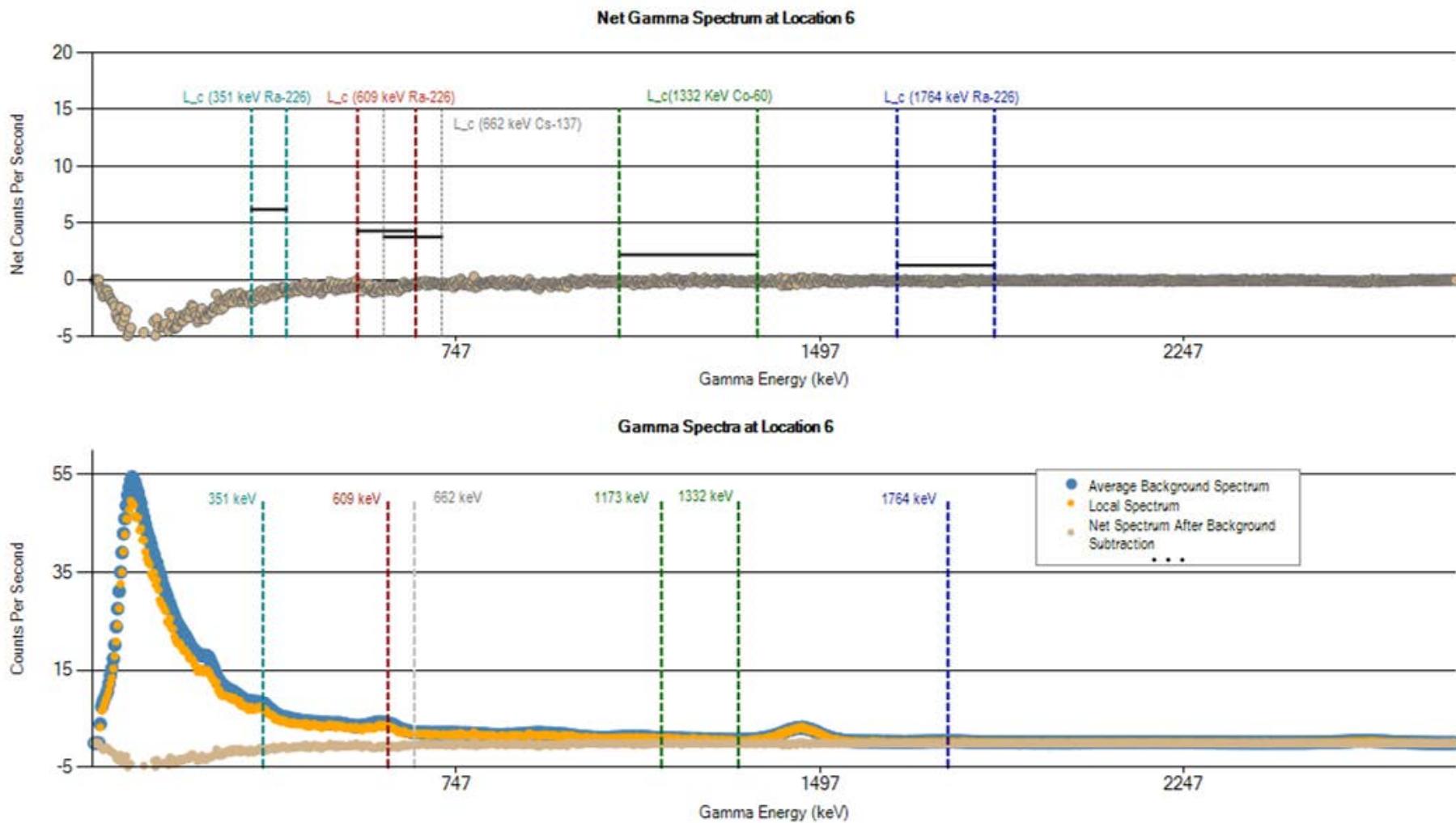
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Location 3 (cps)	861	125	19	21	150	137	106	173	93	3634
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



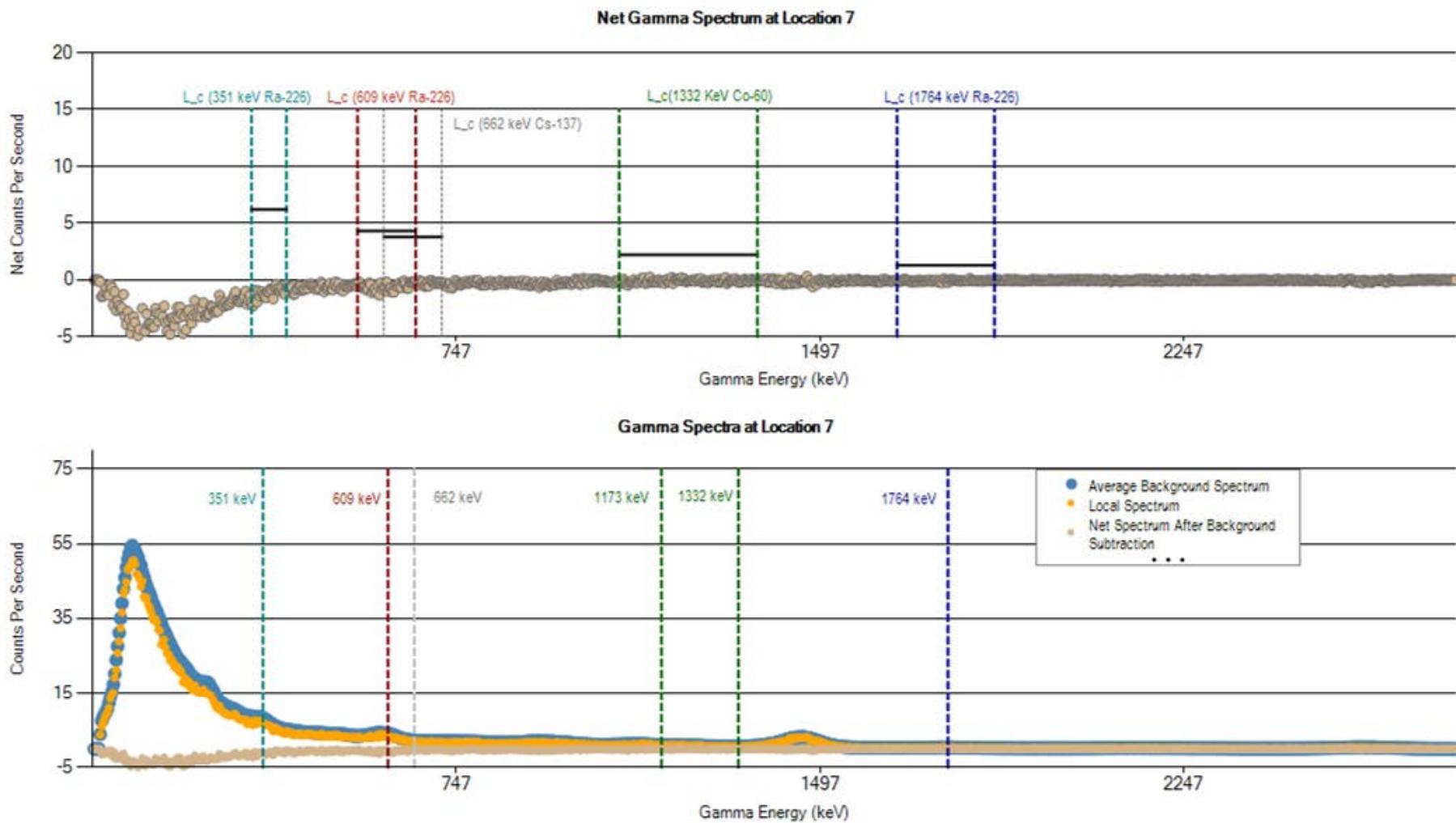
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 4 (cps)	807	118	18	19	142	130	101	162	87	3442
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



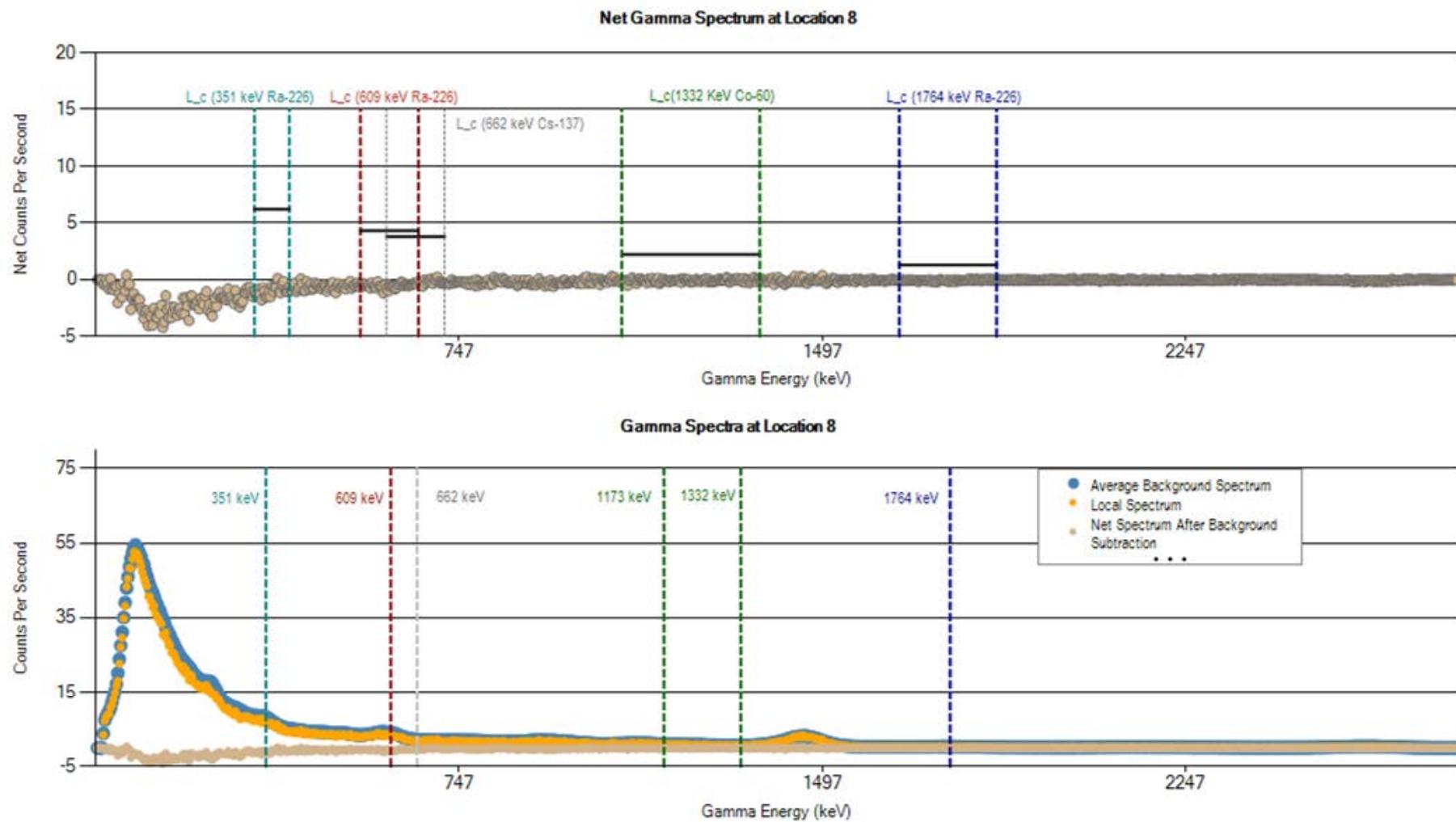
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 5 (cps)	735	109	16	18	128	118	91	148	79	3193
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



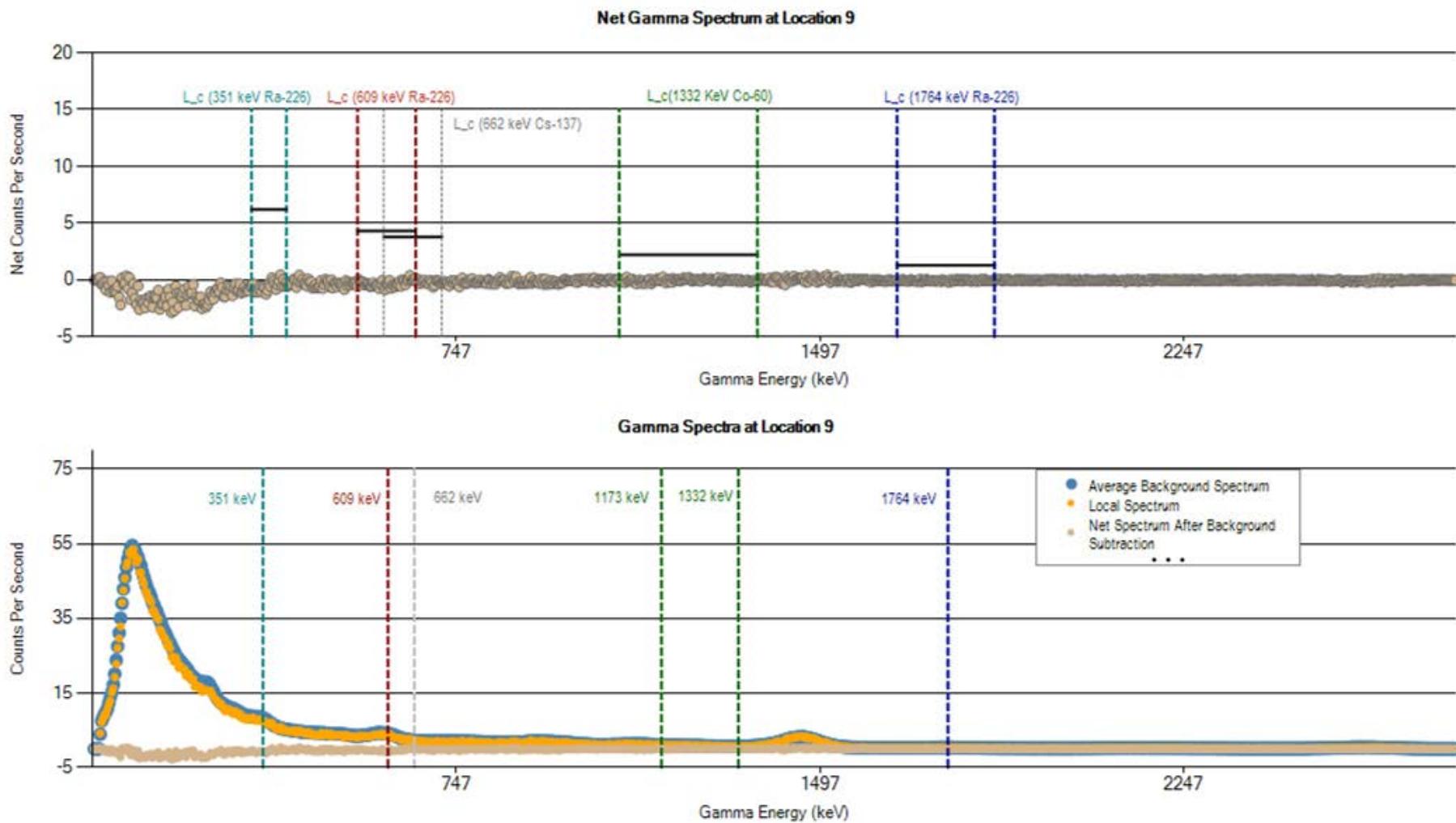
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 6 (cps)	720	108	15	17	127	114	89	145	77	3115
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



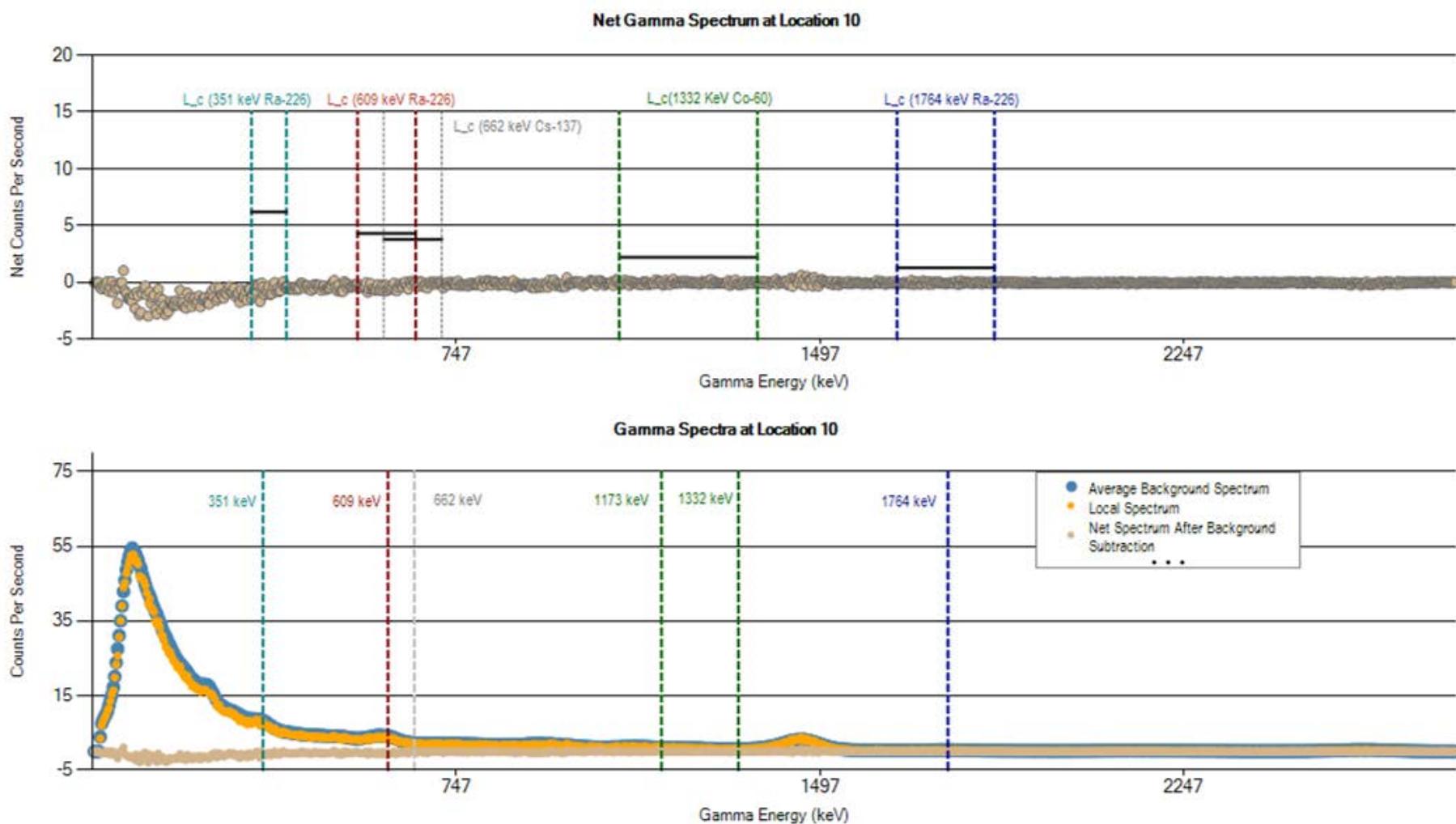
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Location 7 (cps)	733	107	16	18	129	117	91	146	80	3172
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



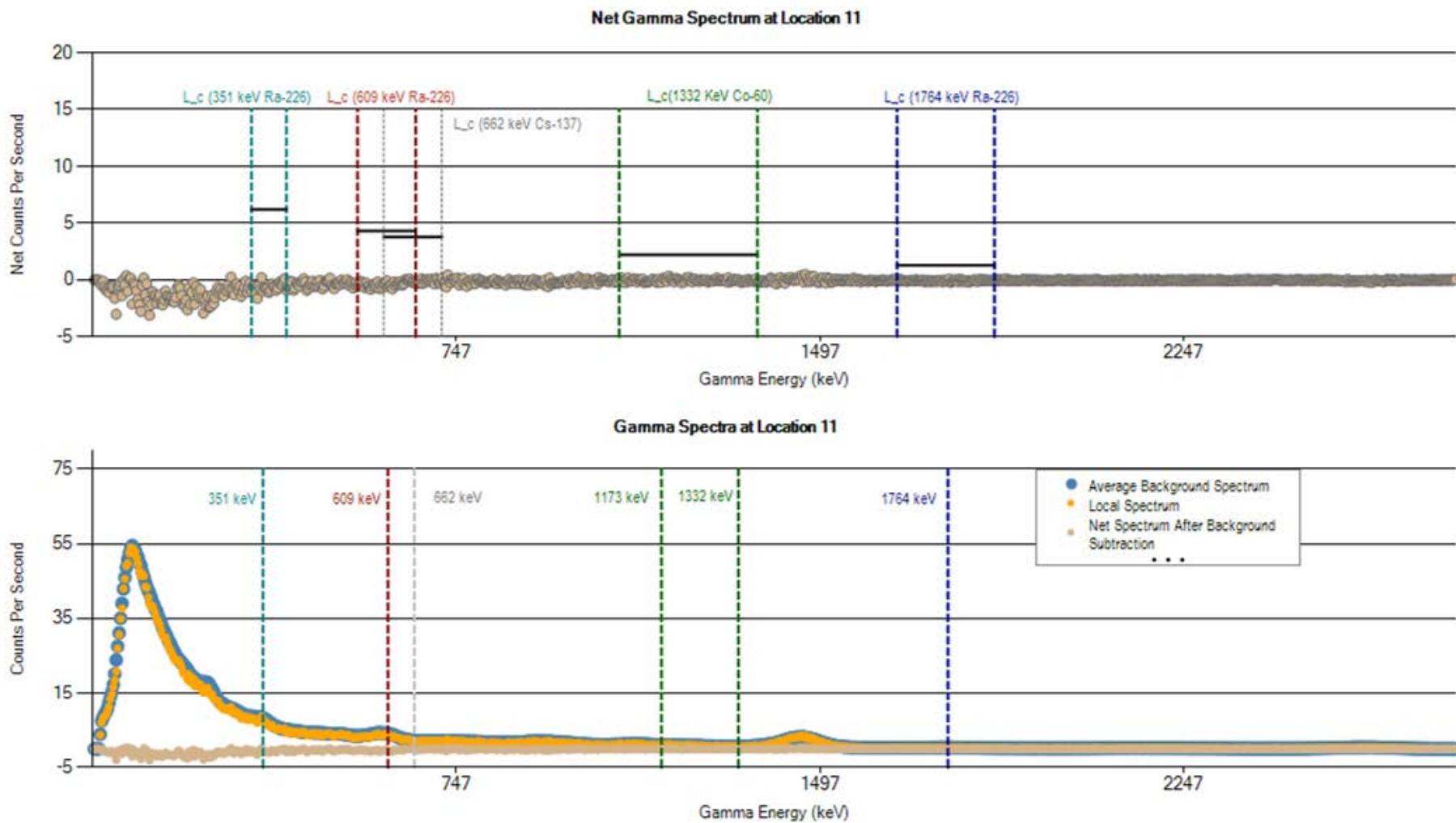
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Location 8 (cps)	748	110	16	18	130	119	93	150	81	3278
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



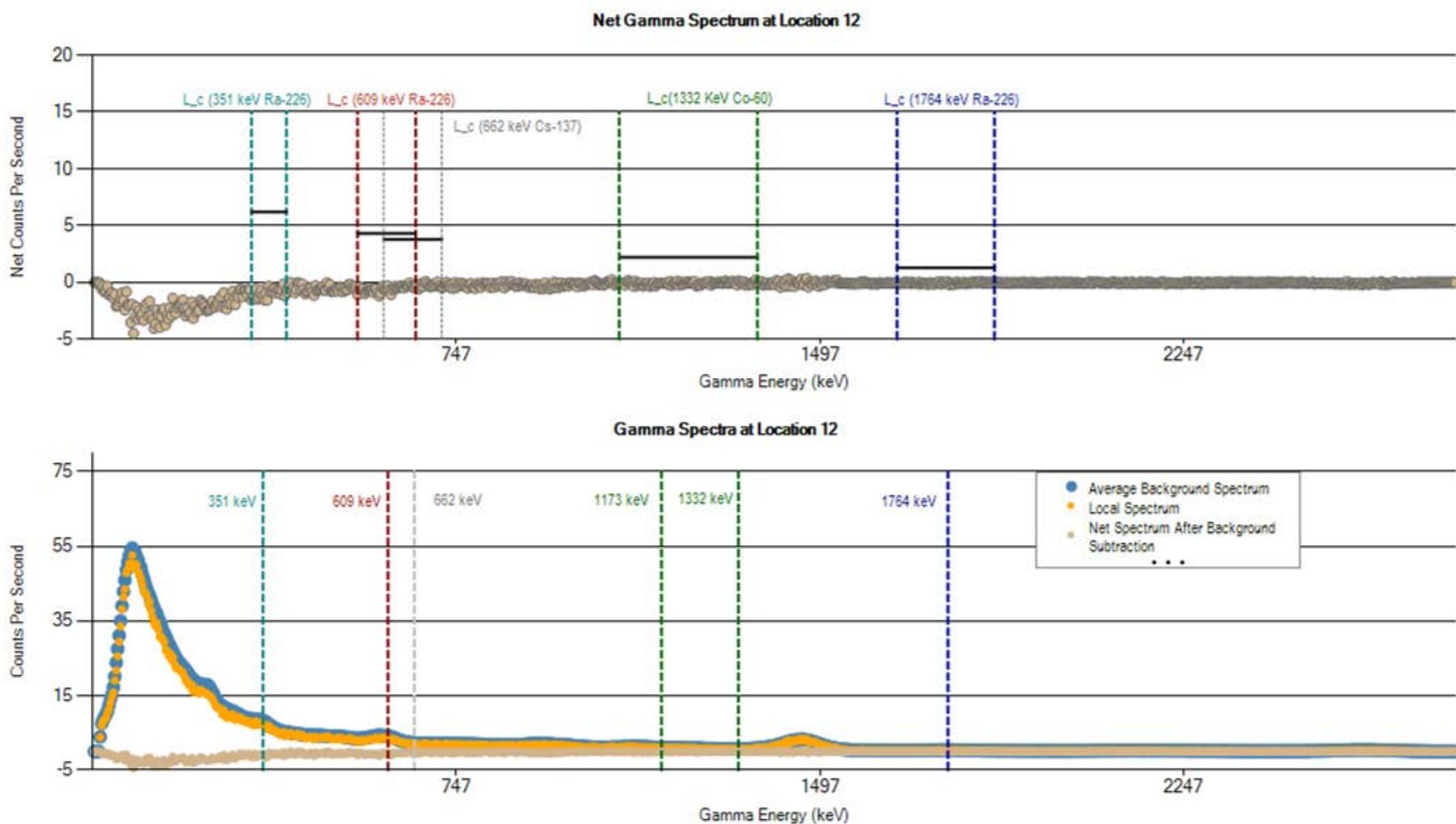
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Location 9 (cps)	795	117	17	19	137	128	98	161	85	3408
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



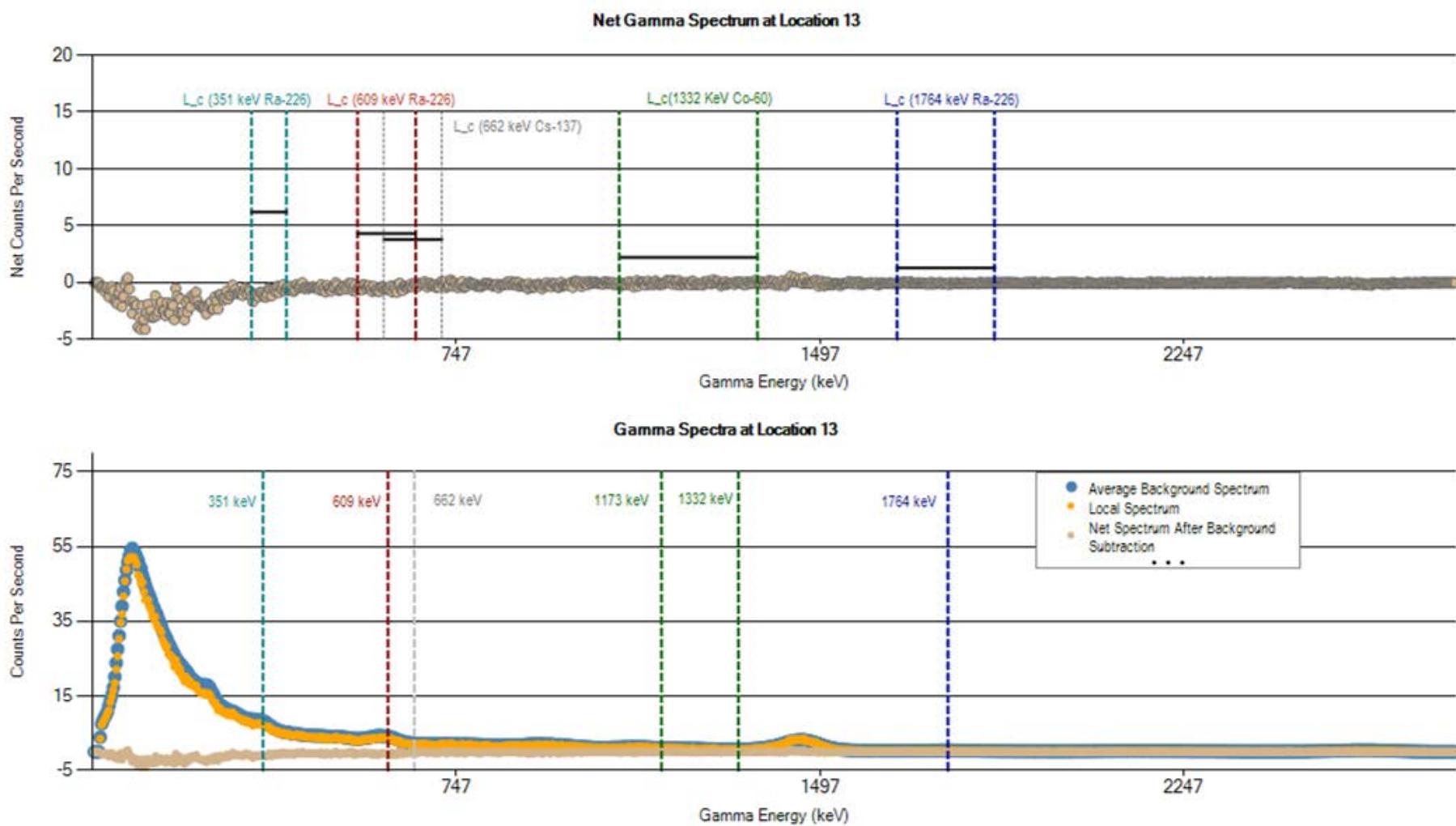
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Location 10 (cps)	792	117	18	19	137	125	98	160	86	3401
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



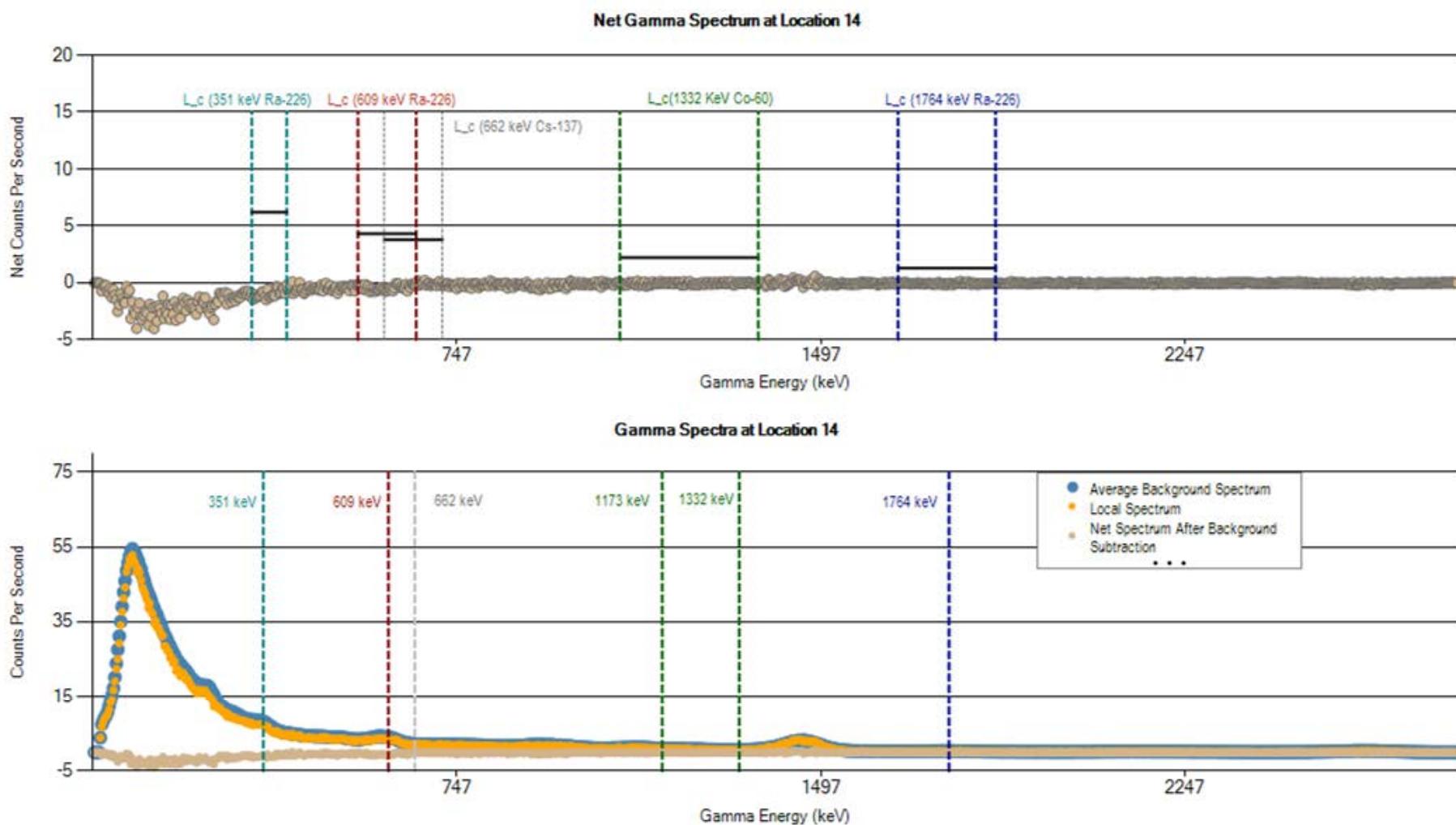
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Location 11 (cps)	784	115	16	19	137	125	99	159	85	3401
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



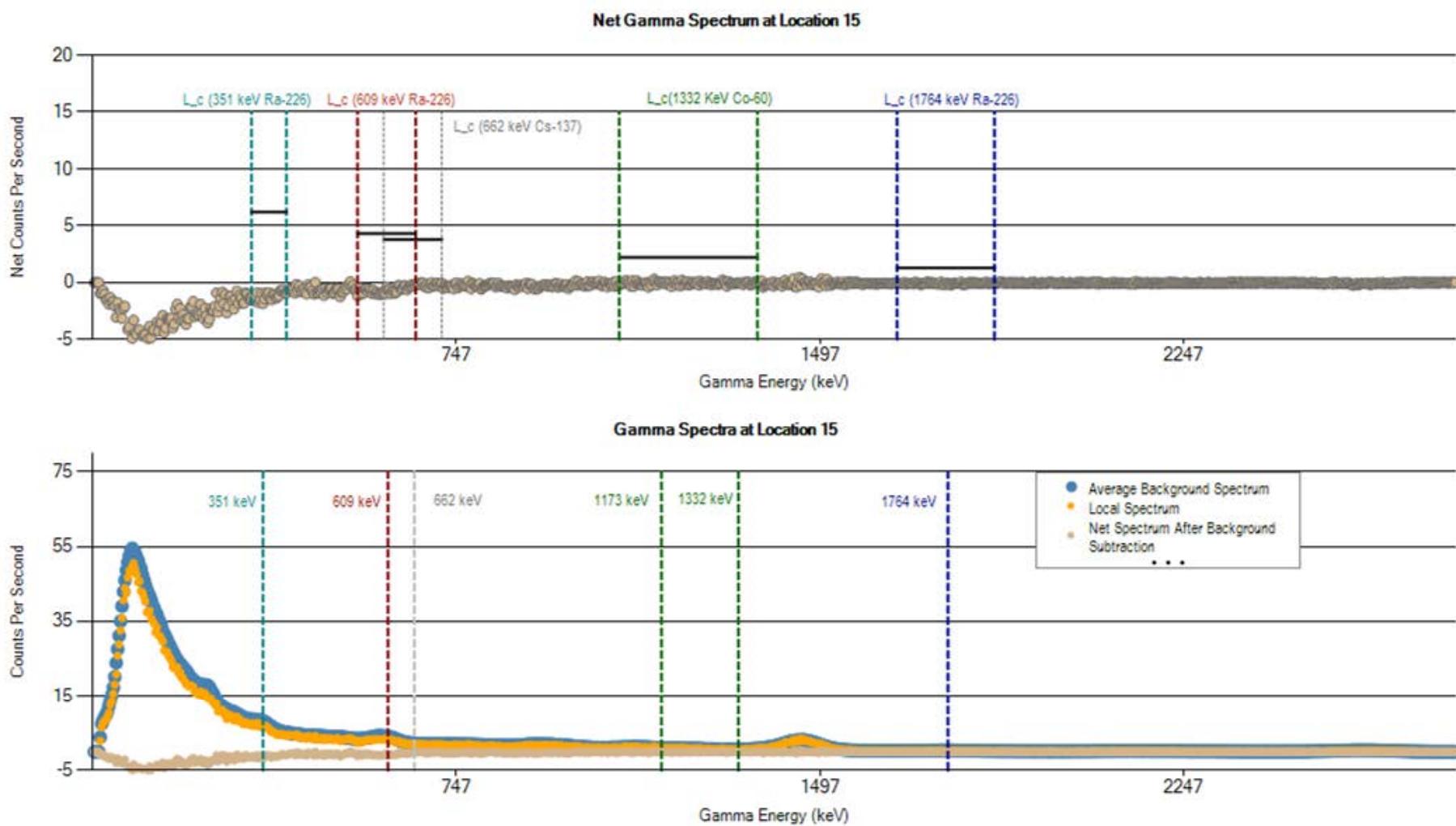
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 12 (cps)	751	112	17	17	130	118	93	151	82	3275
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



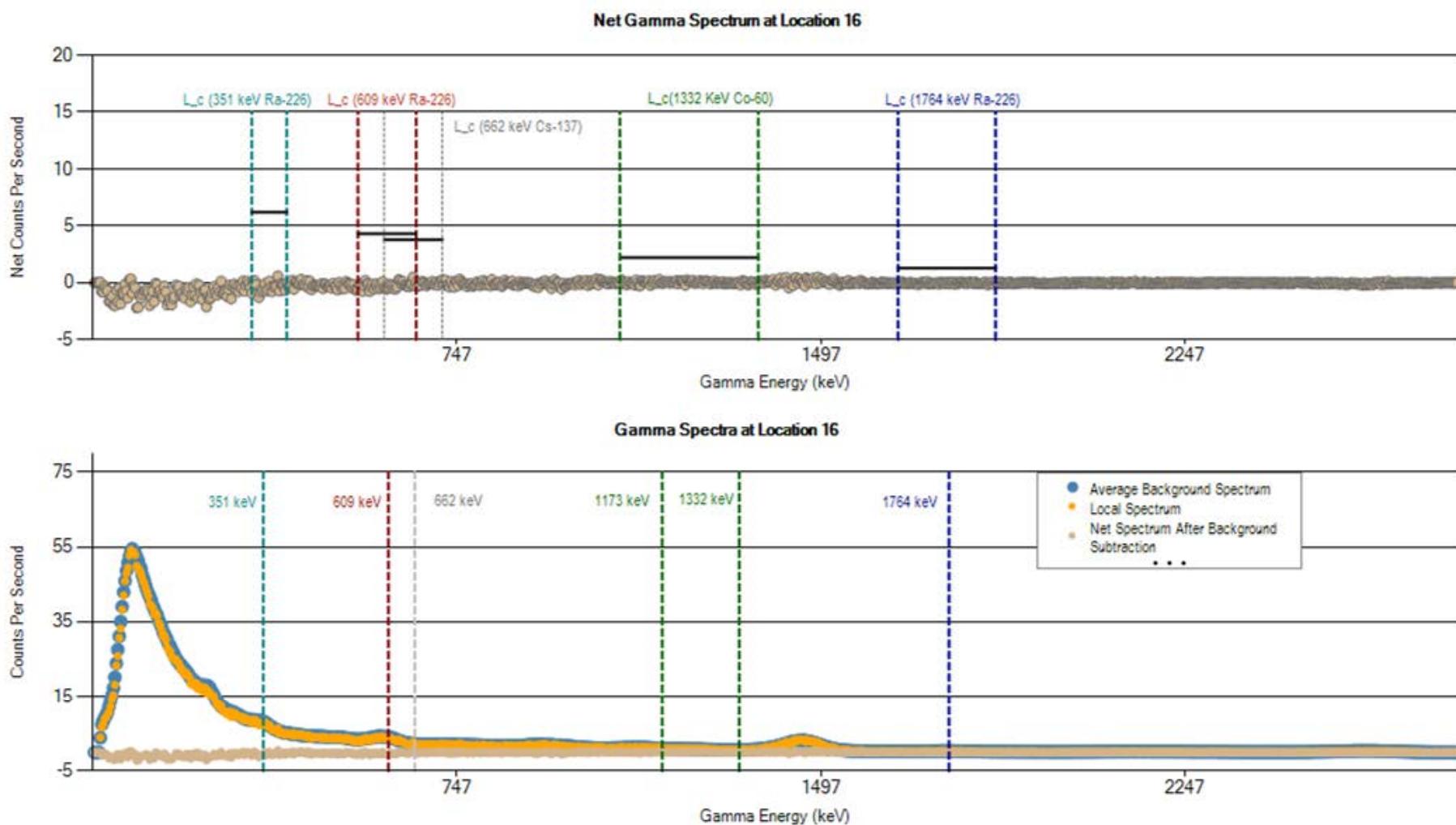
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 13 (cps)	772	114	17	18	135	122	95	154	84	3332
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



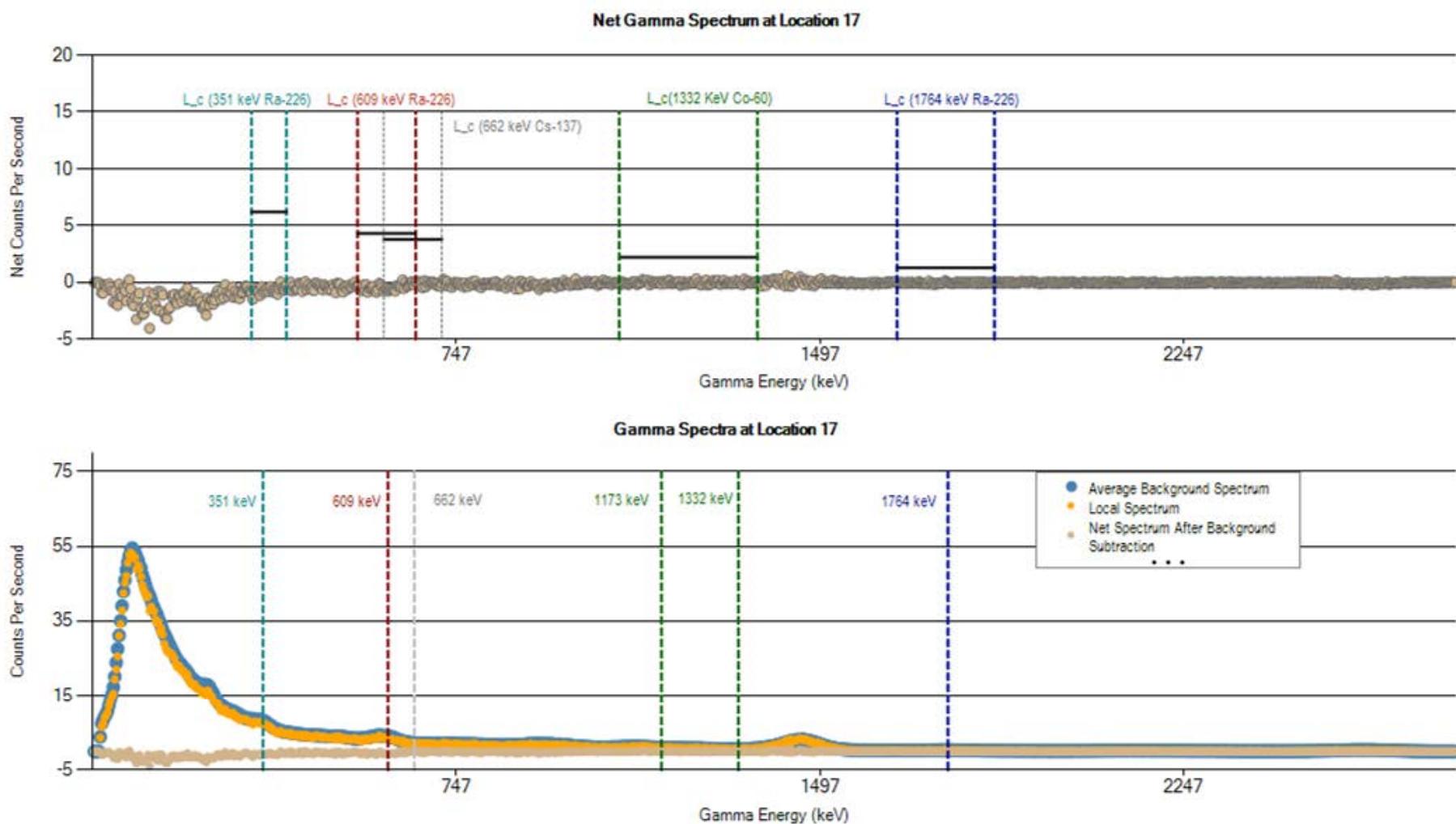
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 14 (cps)	770	115	16	18	135	123	97	151	83	3312
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



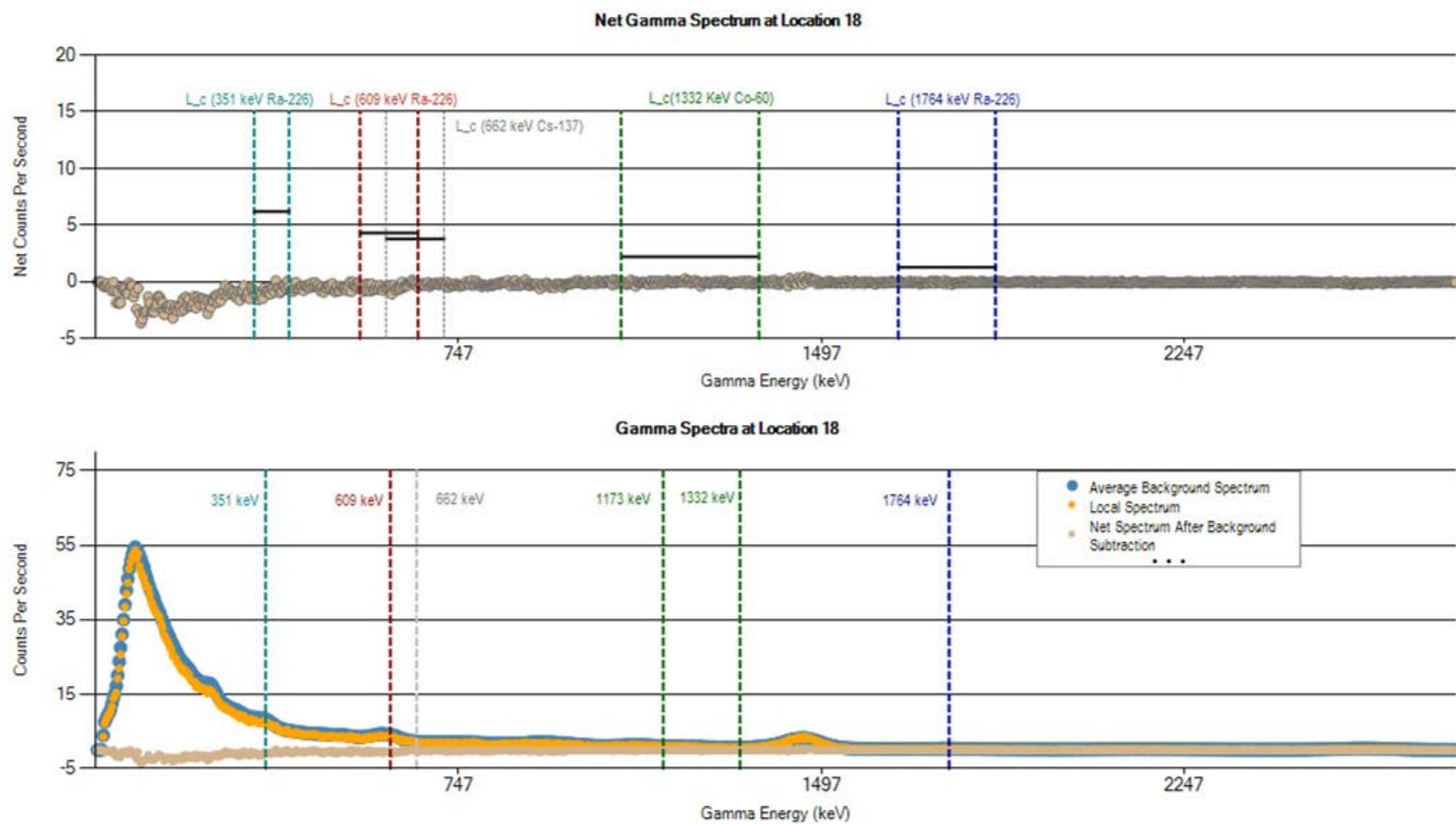
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 15 (cps)	740	111	16	18	126	114	92	146	83	3176
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



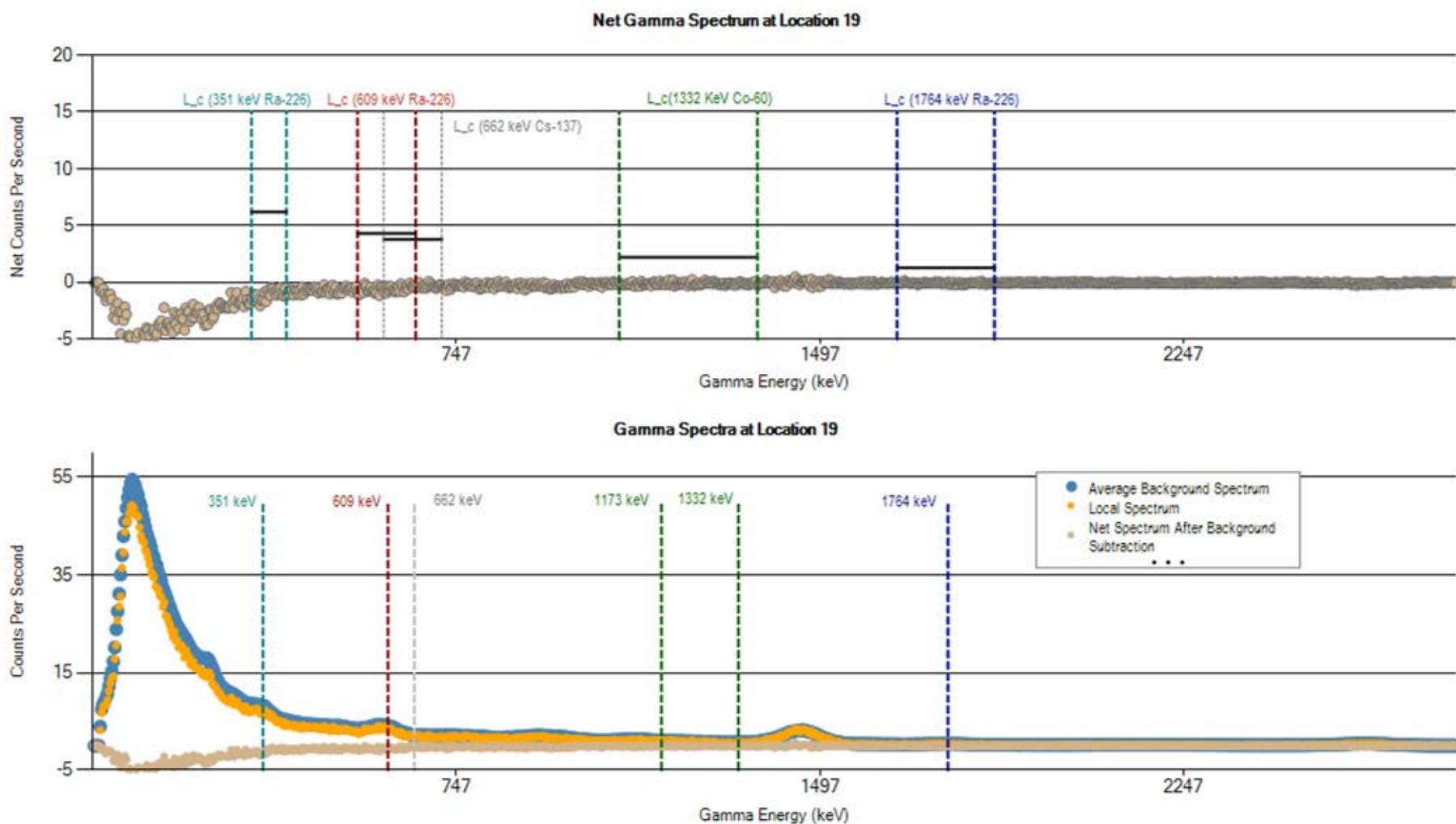
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 16 (cps)	826	121	19	20	140	131	102	165	91	3485
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



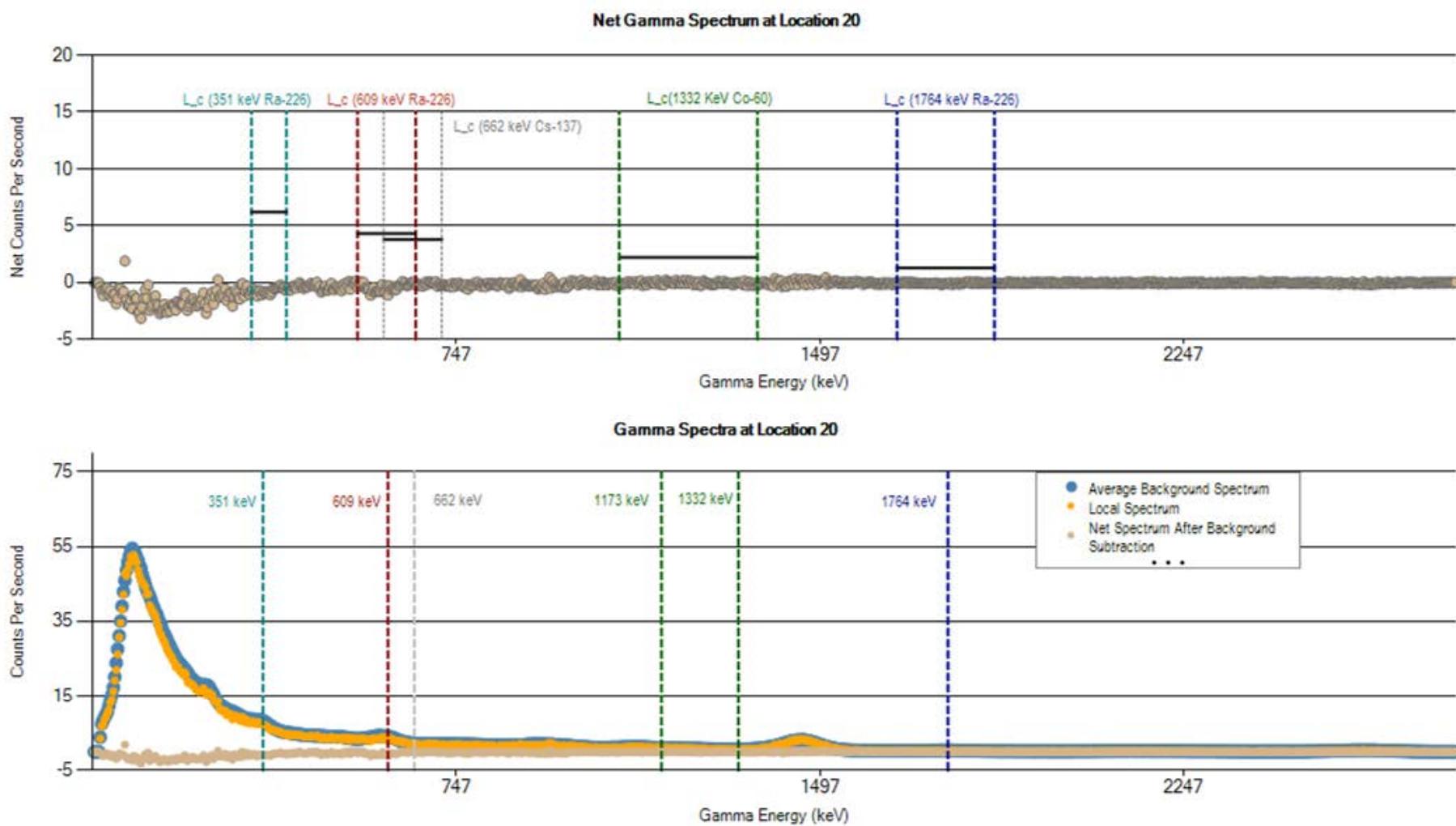
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 17 (cps)	788	116	18	19	136	124	98	157	87	3386
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



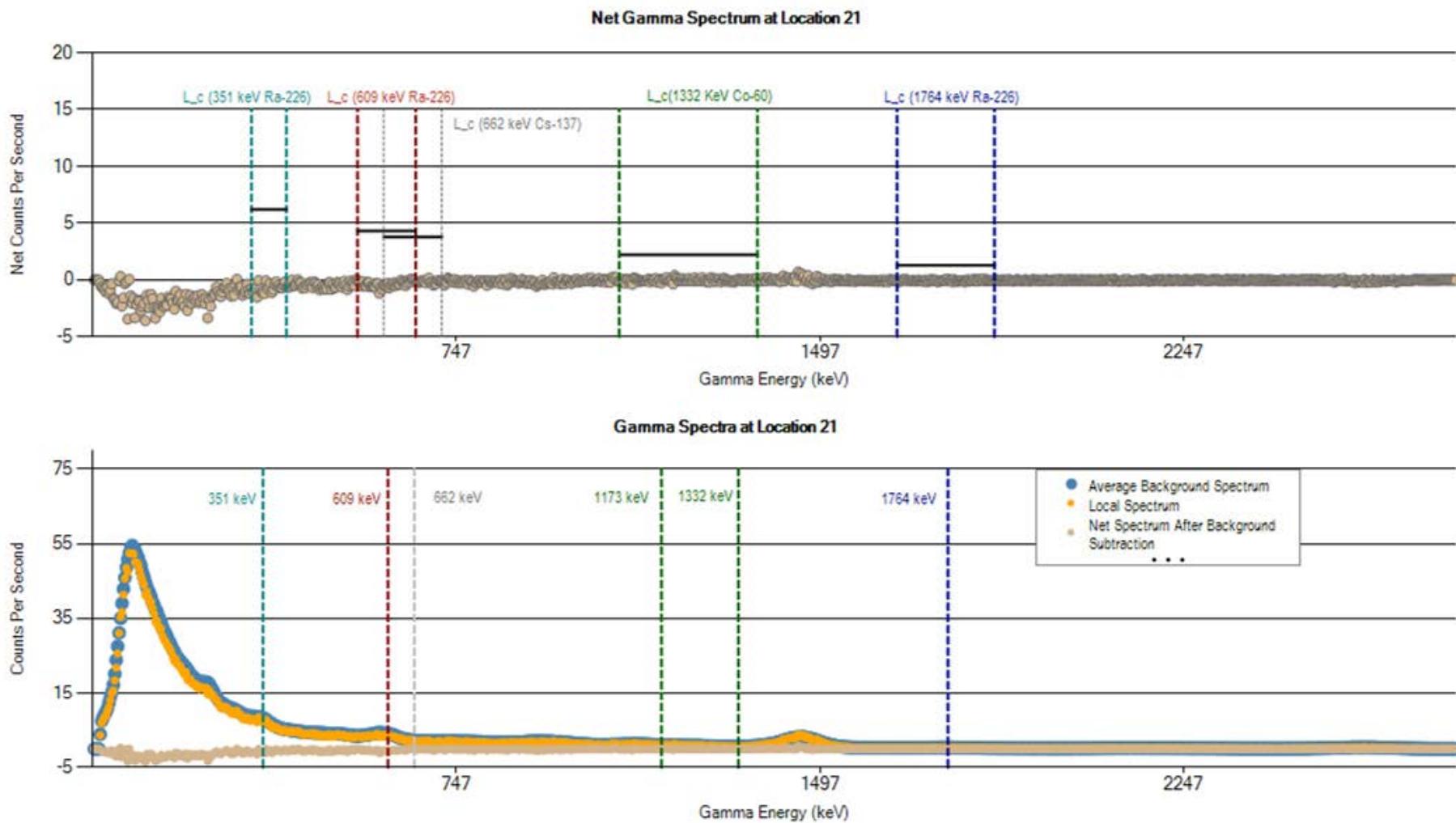
	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 18 (cps)	769	114	17	18	132	123	96	156	84	3345
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



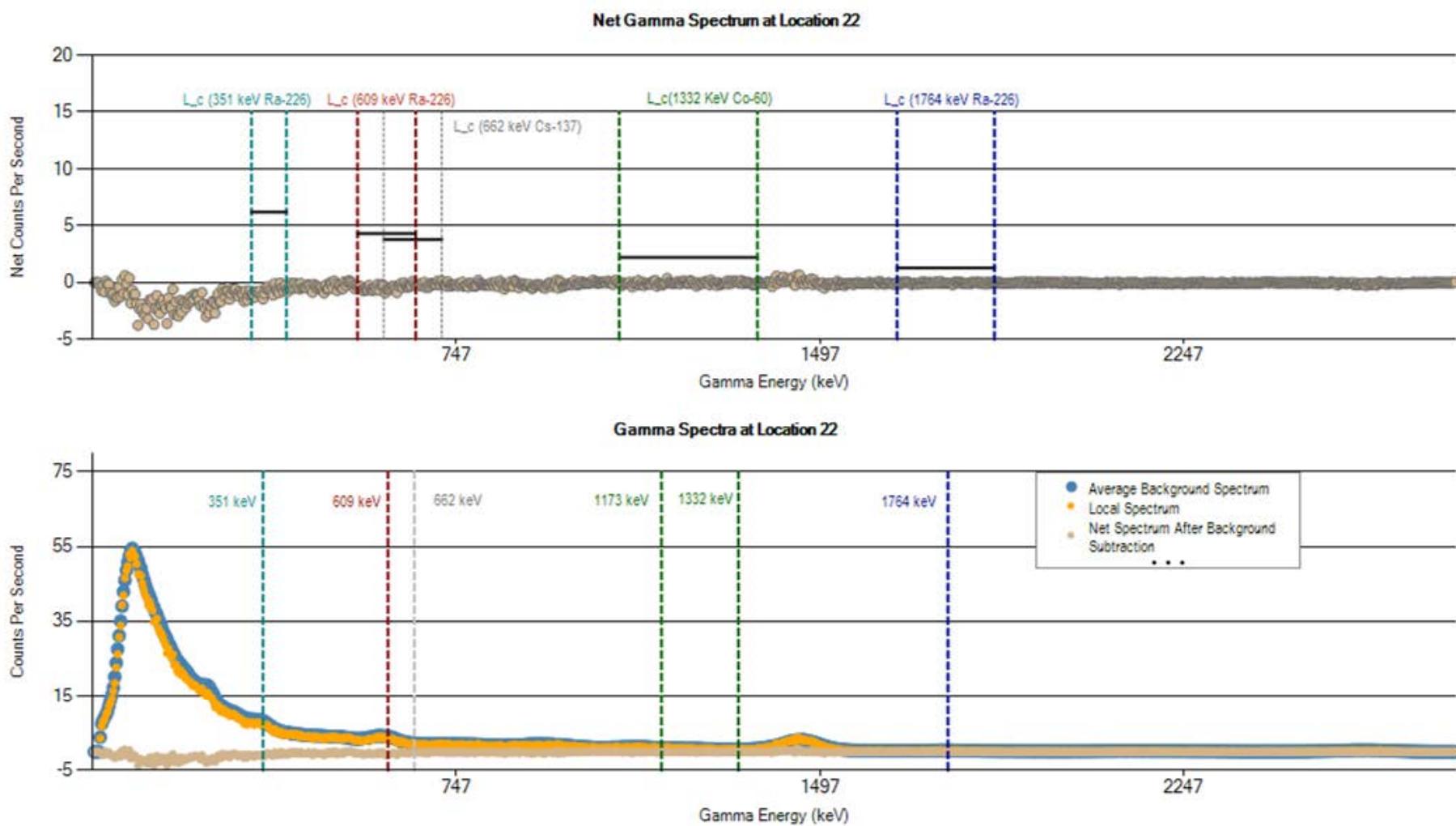
	ROI1	ROI2	ROI3	ROI4	ROI5	ROI6	ROI7	ROI8	ROI9	ROI10
Location 19 (cps)	736	113	16	18	127	117	90	148	78	3153
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 20 (cps)	781	116	17	19	137	124	98	157	84	3370
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 21 (cps)	786	117	17	19	135	125	98	158	87	3367
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255



	ROI 1	ROI 2	ROI 3	ROI 4	ROI 5	ROI 6	ROI 7	ROI 8	ROI 9	ROI 10
Location 22 (cps)	784	116	18	18	137	123	96	156	85	3366
Static IL (cps)	1052	150	35	41	201	189	146	229	120	4255

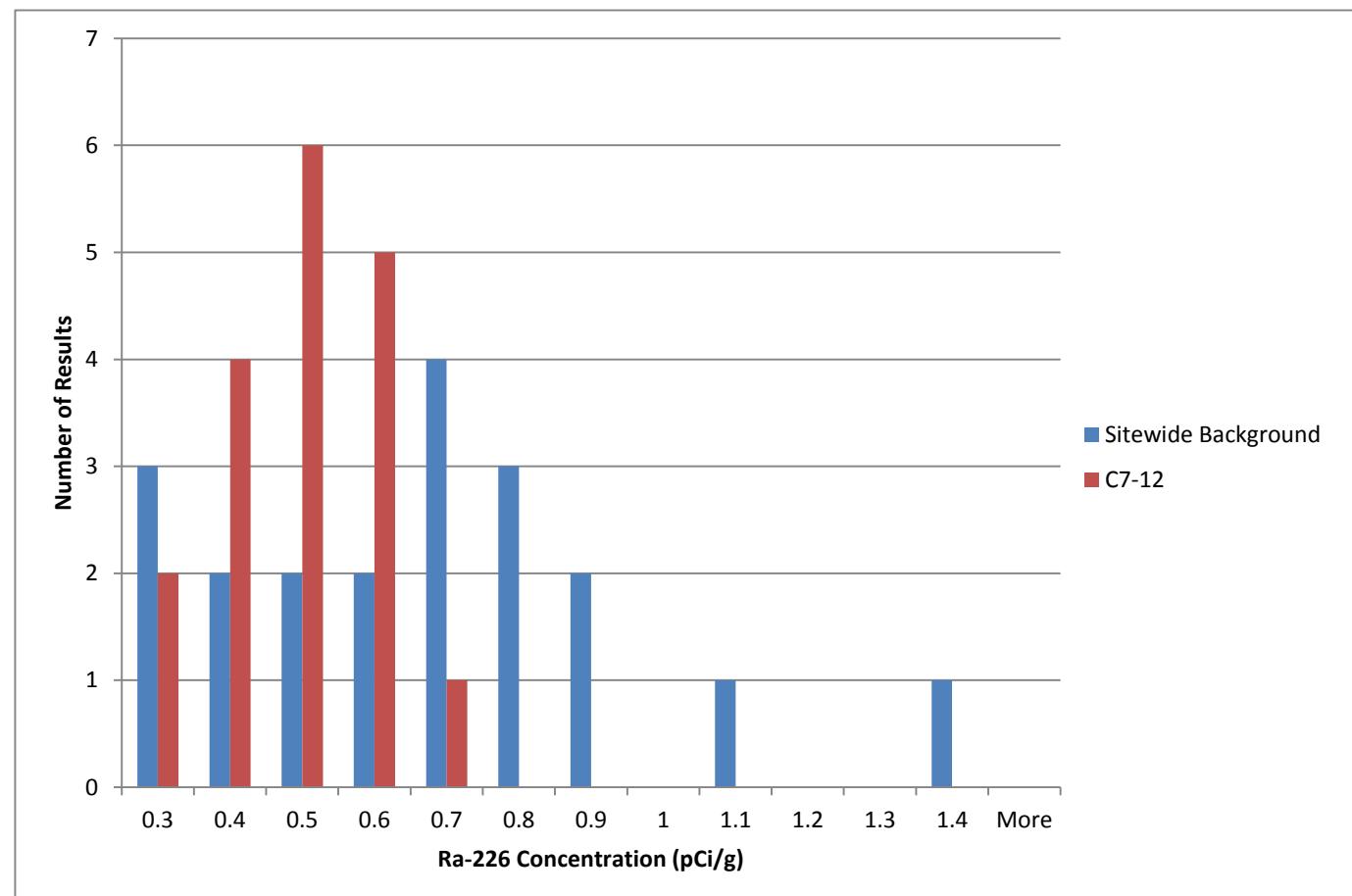
Histogram, RSY C7 (Use 12) vs. Sitewide Background

Background

Bin	Frequency
0.3	3
0.4	2
0.5	2
0.6	2
0.7	4
0.8	3
0.9	2
1	0
1.1	1
1.2	0
1.3	0
1.4	1
More	0

C7-12

Bin	Frequency
0.3	2
0.4	4
0.5	6
0.6	5
0.7	1
0.8	0
0.9	0
1	0
1.1	0
1.2	0
1.3	0
1.4	0
More	0



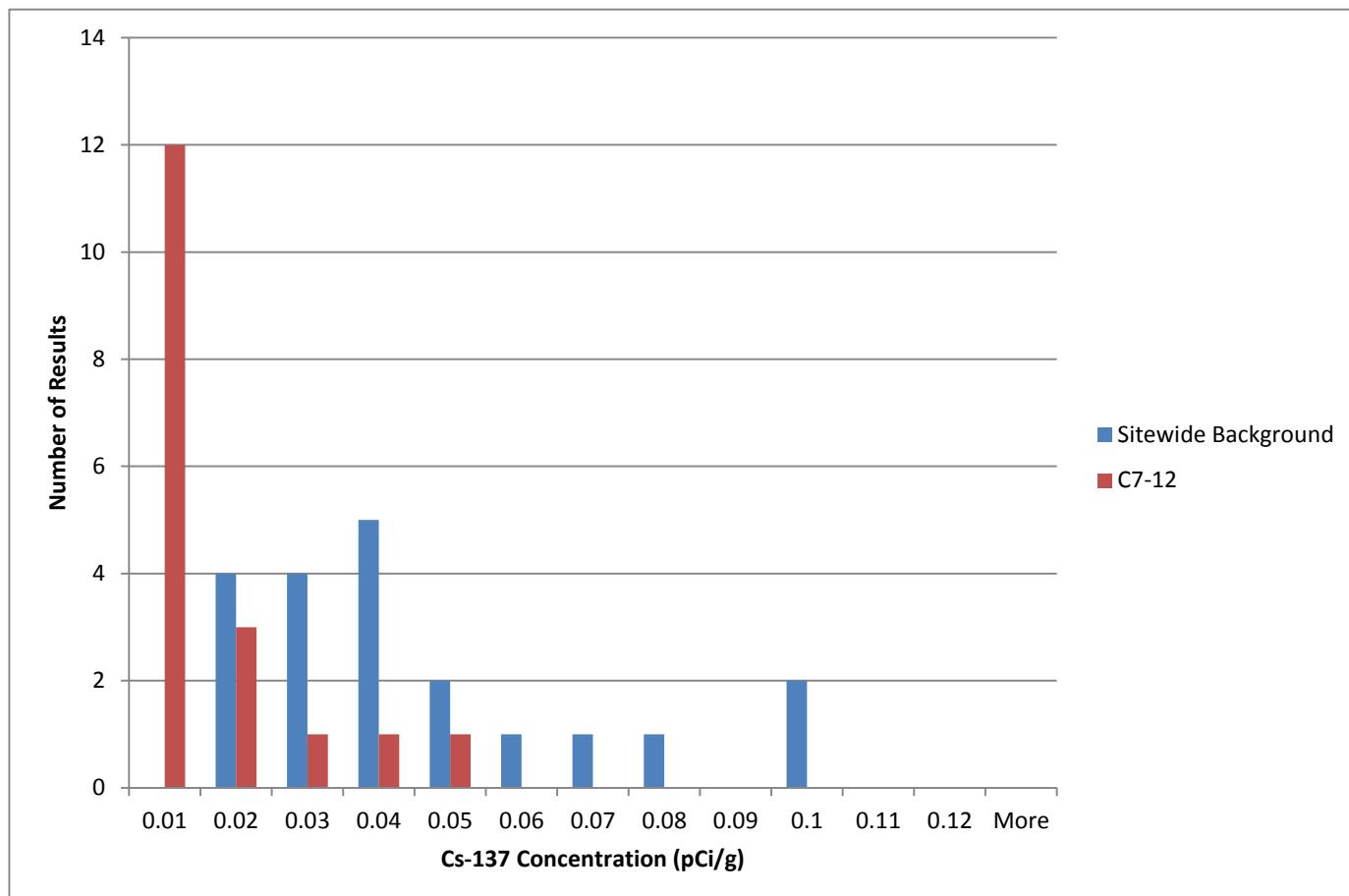
Histogram, RSY C7 (Use 12) vs. Sitewide Background

Background

Bin	Frequency
0.01	0
0.02	4
0.03	4
0.04	5
0.05	2
0.06	1
0.07	1
0.08	1
0.09	0
0.1	2
0.11	0
0.12	0
More	0

C7-12

Bin	Frequency
0.01	12
0.02	3
0.03	1
0.04	1
0.05	1
0.06	0
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



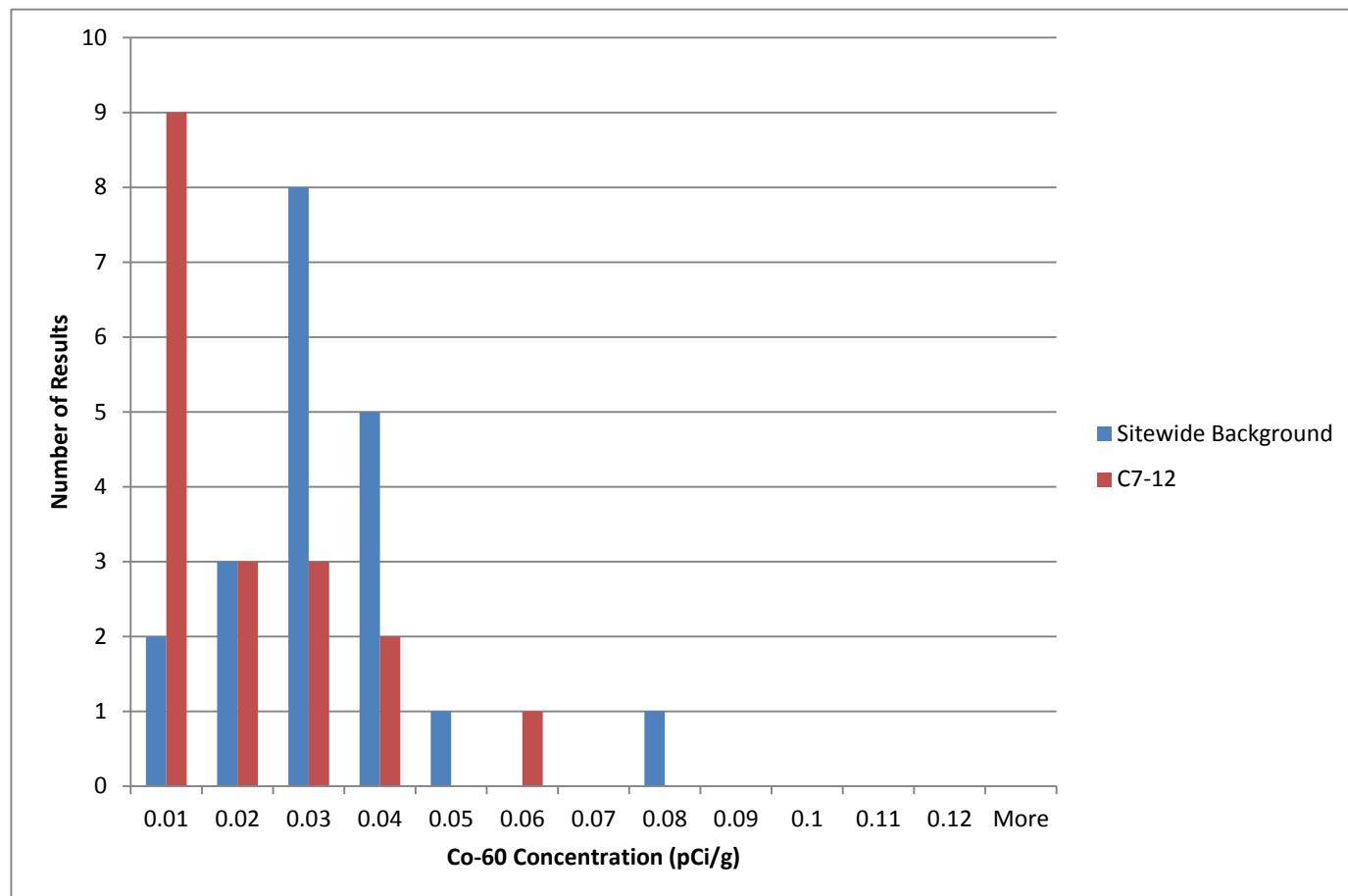
Histogram, RSY C7 (Use 12) vs. Sitewide Background

Background

Bin	Frequency
0.01	2
0.02	3
0.03	8
0.04	5
0.05	1
0.06	0
0.07	0
0.08	1
0.09	0
0.1	0
0.11	0
0.12	0
More	0

C7-12

Bin	Frequency
0.01	9
0.02	3
0.03	3
0.04	2
0.05	0
0.06	1
0.07	0
0.08	0
0.09	0
0.1	0
0.11	0
0.12	0
More	0



TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

TestAmerica Job ID: 160-29416-2

Client Project/Site: Hunters Point Naval Shipyard - Parcel E2

For:

Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Eddie Kalombo

Rhonda Ridenhower

Authorized for release by:

8/7/2018 10:48:43 AM

Rhonda Ridenhower, Manager of Project Management
(314)298-8566

rhonda.ridenhower@testamericainc.com

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results through

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www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Cover Page	1
Table of Contents	2
Case Narrative	3
Chain of Custody	5
Receipt Checklists	7
Definitions/Glossary	8
Method Summary	9
Sample Summary	10
Client Sample Results	11
QC Sample Results	21
QC Association Summary	23
Tracer Carrier Summary	24

1
2
3
4
5
6
7
8
9
10
11
12

Case Narrative

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Job ID: 160-29416-2

Laboratory: TestAmerica St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: Hunters Point Naval Shipyard - Parcel E2

Report Number: 160-29416-2

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica St. Louis attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The following clean-up methods for Organic analyses may have been used on the samples in this data set. Specific methods employed are documented on the batch extraction logs:

Method 3600C: Cleanup

Method 3620C: Florisil Cleanup

Method 3630C: Silica Gel Cleanup

Method 3640A: Gel-Permeation Cleanup

Method 3650B: Acid-Base Partition Cleanup

Method 3660B: Sulfur Cleanup

Case Narrative

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Job ID: 160-29416-2 (Continued)

Laboratory: TestAmerica St. Louis (Continued)

Method 3665A: Sulfuric Acid/Permanganate Cleanup

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

RECEIPT

The samples were received on 07/10/2018; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 19.0 C.

TOTAL BETA STRONTIUM (GFPC)

Samples PE2-RSYC7-U12-S001 (160-29416-1) and PE2-RSYC7-U12-S011 (160-29416-11) were analyzed for Total Beta Strontium (GFPC) in accordance with EPA 905. The samples were dried on 07/10/2018, prepared on 07/16/2018 and analyzed on 08/02/2018.

The following samples could not be thoroughly homogenized before sub-sampling was performed due to sample matrix: PE2-RSYC7-U12-S001 (160-29416-1) and PE2-RSYC7-U12-S011 (160-29416-11). The samples contained rocks of varying sizes.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples PE2-RSYC7-U12-S001 (160-29416-1), PE2-RSYC7-U12-S002 (160-29416-2), PE2-RSYC7-U12-S003 (160-29416-3), PE2-RSYC7-U12-S004 (160-29416-4), PE2-RSYC7-U12-S005 (160-29416-5), PE2-RSYC7-U12-S006 (160-29416-6), PE2-RSYC7-U12-S007 (160-29416-7), PE2-RSYC7-U12-S008 (160-29416-8), PE2-RSYC7-U12-S009 (160-29416-9), PE2-RSYC7-U12-S010 (160-29416-10), PE2-RSYC7-U12-S011 (160-29416-11), PE2-RSYC7-U12-S012 (160-29416-12), PE2-RSYC7-U12-S013 (160-29416-13), PE2-RSYC7-U12-S014 (160-29416-14), PE2-RSYC7-U12-S015 (160-29416-15), PE2-RSYC7-U12-S016 (160-29416-16), PE2-RSYC7-U12-S017 (160-29416-17) and PE2-RSYC7-U12-S018 (160-29416-18) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 07/10/2018, prepared on 07/11/2018 and analyzed on 08/03/2018.

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline.

PE2-RSYC7-U12-S002 (160-29416-2), PE2-RSYC7-U12-S012 (160-29416-12), PE2-RSYC7-U12-S013 (160-29416-13) and PE2-RSYC7-U12-S017 (160-29416-17)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

CHAIN OF CUSTODY

Ref. Document # PE2_RSYC7_USE12_SH SAND#550
 Page 1 of 2

APTIM Federal Services, LLC
 4005 Port Chicago Hwy
 Concord, CA 94520

Project Manager: <u>Nels Johnson</u> (Name & phone #)		<div style="float: right; margin-right: 10px;"> Project Number: <u>500506</u> CTO-013 RSYC7 USE 12 Revetment spolis Systematic Project Name: _____ Project Location: <u>HPSN - Parcel E-2</u> Purchase Order #: <u>202296</u> Shipment/Pickup Date: <u>7.9.18</u> Waybill Number: <u>1266545131191345</u> Lab Destination: <u>TestAmerica (St Louis Lab)</u> <u>13715 Rider Trail North</u> <u>Earth City, MO 63045</u> Lab Contact Name / ph. #: <u>Rhonda Ridenhower (314) 298-8566</u> Gamma Spec (EPA 1911.M) - Total Strontium (EPA 905 MOD) Strontium 90 (EPA 905 MOD) Dose Rate µR/Hr (7 day -grrowth preliminary results and full 21 day grrowth for full gamma results) </div> <div style="clear: both; margin-top: 10px;"> Sampler's Name(s): <u>Eddie Kalombo</u> <u>Concord, CA, 94520</u> Sampler's Accts. # Collection Information </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 15%;">Sample ID Number</th> <th style="width: 15%;">Sample Description</th> <th style="width: 15%;">Date</th> <th style="width: 15%;">Time</th> <th style="width: 15%;">Method</th> <th style="width: 15%;">Matrix</th> <th style="width: 15%;">Preservative (water)</th> <th style="width: 15%;">Preservative (solid)</th> <th style="width: 15%;">Container Type</th> <th style="width: 15%;"># Containers</th> <th style="width: 15%;">N/A</th> <th style="width: 15%;">N/A</th> </tr> </thead> <tbody> <tr> <td>PE2-RSYC7-U12-S001</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1300</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S002</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1304</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S003</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1308</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S004</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1312</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S005</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1316</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S006</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1320</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S007</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1324</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S008</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1328</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S009</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1332</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> <tr> <td>PE2-RSYC7-U12-S010</td> <td>Parcel E-2 RSYC7 USE 12 Systematic</td> <td>7/3/18</td> <td>1336</td> <td>G</td> <td>SO</td> <td>1</td> <td>16 oz. plastic jar</td> <td>X</td> <td></td> <td></td> <td>X</td> </tr> </tbody> </table>										Sample ID Number	Sample Description	Date	Time	Method	Matrix	Preservative (water)	Preservative (solid)	Container Type	# Containers	N/A	N/A	PE2-RSYC7-U12-S001	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1300	G	SO	1	16 oz. plastic jar	X	X	X	X	PE2-RSYC7-U12-S002	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1304	G	SO	1	16 oz. plastic jar	X			X	PE2-RSYC7-U12-S003	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1308	G	SO	1	16 oz. plastic jar	X			X	PE2-RSYC7-U12-S004	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1312	G	SO	1	16 oz. plastic jar	X			X	PE2-RSYC7-U12-S005	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1316	G	SO	1	16 oz. plastic jar	X			X	PE2-RSYC7-U12-S006	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1320	G	SO	1	16 oz. plastic jar	X			X	PE2-RSYC7-U12-S007	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1324	G	SO	1	16 oz. plastic jar	X			X	PE2-RSYC7-U12-S008	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1328	G	SO	1	16 oz. plastic jar	X			X	PE2-RSYC7-U12-S009	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1332	G	SO	1	16 oz. plastic jar	X			X	PE2-RSYC7-U12-S010	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1336	G	SO	1	16 oz. plastic jar	X			X
Sample ID Number	Sample Description	Date	Time	Method	Matrix	Preservative (water)	Preservative (solid)	Container Type	# Containers	N/A	N/A																																																																																																																																				
PE2-RSYC7-U12-S001	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1300	G	SO	1	16 oz. plastic jar	X	X	X	X																																																																																																																																				
PE2-RSYC7-U12-S002	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1304	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				
PE2-RSYC7-U12-S003	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1308	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				
PE2-RSYC7-U12-S004	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1312	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				
PE2-RSYC7-U12-S005	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1316	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				
PE2-RSYC7-U12-S006	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1320	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				
PE2-RSYC7-U12-S007	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1324	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				
PE2-RSYC7-U12-S008	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1328	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				
PE2-RSYC7-U12-S009	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1332	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				
PE2-RSYC7-U12-S010	Parcel E-2 RSYC7 USE 12 Systematic	7/3/18	1336	G	SO	1	16 oz. plastic jar	X			X																																																																																																																																				

Special Instructions:
 Analyze for Total Strontium as a screening step, and isotopic Sr-80 only if Total Strontium is above project action limit of u.u.51 pCi/g.
 7 days ingrown draft and follow with 21 days final.

<input type="checkbox"/> 24-hr	<input type="checkbox"/> 3-day	<input type="checkbox"/> 10-day	<input type="checkbox"/> 1	<input type="checkbox"/> II	<input type="checkbox"/> III	<input type="checkbox"/> Project Specific:
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Level Of QC Required:

<input type="checkbox"/>					
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Standard TAT -10-day	<input type="checkbox"/>					
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Reinforced By:	<u>TAOJUN ZHANG</u>	Date: <u>7/3/2018</u>	Received By: <u>EDDIE KALOMBO</u>	Date: <u>7.3.18</u>	<input type="checkbox"/> Method Codes
Reinforced By:	<u>EDDIE KALOMBO</u>	Date: <u>7.9.18</u>	Received By: <u>Melinda Palmer</u>	Date: <u>7/9/18</u>	<input type="checkbox"/> Matrix Codes
Reinforced By:		Date: <u>1600</u>	Received By: _____	Date: <u>1600</u>	<input type="checkbox"/> DW = Drinking Water
Reinforced By:		Date: _____	Received By: _____	Date: _____	<input type="checkbox"/> GW = Ground Water
Reinforced By:		Date: _____	Received By: _____	Date: _____	<input type="checkbox"/> WW = Waste Water
		Date: _____	Received By: _____	Date: _____	<input type="checkbox"/> A = Air
		Date: _____	Received By: _____	Date: _____	<input type="checkbox"/> ABS=Asbestos, PO=Pipe Opening

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Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-29416-2

Login Number: 29416**List Source: TestAmerica St. Louis****List Number: 1****Creator: Press, Nicholas B**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
 Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation **These commonly used abbreviations may or may not be present in this report.**

□	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Method Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Method	Method Description	Protocol	Laboratory
905.0	Total Beta Strontium (GFPC)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-0	Preparation, Digestion/ Precipitate	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

DOE = U.S. Department of Energy

None = None

Laboratory References:

TAL SL = TestAmerica St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566

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Sample Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
160-29416-1	PE2-RSYC7-U12-S001	Solid	07/03/18 13:00	07/10/18 08:50
160-29416-2	PE2-RSYC7-U12-S002	Solid	07/03/18 13:04	07/10/18 08:50
160-29416-3	PE2-RSYC7-U12-S003	Solid	07/03/18 13:08	07/10/18 08:50
160-29416-4	PE2-RSYC7-U12-S004	Solid	07/03/18 13:12	07/10/18 08:50
160-29416-5	PE2-RSYC7-U12-S005	Solid	07/03/18 13:16	07/10/18 08:50
160-29416-6	PE2-RSYC7-U12-S006	Solid	07/03/18 13:20	07/10/18 08:50
160-29416-7	PE2-RSYC7-U12-S007	Solid	07/03/18 13:24	07/10/18 08:50
160-29416-8	PE2-RSYC7-U12-S008	Solid	07/03/18 13:28	07/10/18 08:50
160-29416-9	PE2-RSYC7-U12-S009	Solid	07/03/18 13:32	07/10/18 08:50
160-29416-10	PE2-RSYC7-U12-S010	Solid	07/03/18 13:36	07/10/18 08:50
160-29416-11	PE2-RSYC7-U12-S011	Solid	07/03/18 13:39	07/10/18 08:50
160-29416-12	PE2-RSYC7-U12-S012	Solid	07/03/18 13:43	07/10/18 08:50
160-29416-13	PE2-RSYC7-U12-S013	Solid	07/03/18 13:47	07/10/18 08:50
160-29416-14	PE2-RSYC7-U12-S014	Solid	07/03/18 13:51	07/10/18 08:50
160-29416-15	PE2-RSYC7-U12-S015	Solid	07/03/18 13:54	07/10/18 08:50
160-29416-16	PE2-RSYC7-U12-S016	Solid	07/03/18 13:58	07/10/18 08:50
160-29416-17	PE2-RSYC7-U12-S017	Solid	07/03/18 14:02	07/10/18 08:50
160-29416-18	PE2-RSYC7-U12-S018	Solid	07/03/18 14:06	07/10/18 08:50

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S001**Lab Sample ID: 160-29416-1**

Date Collected: 07/03/18 13:00

Matrix: Solid

Date Received: 07/10/18 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	0.0134	U	0.0606	0.0606	0.331	0.0487	pCi/g	07/16/18 13:23	08/02/18 05:39	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	88.3		40 - 110					07/16/18 13:23	08/02/18 05:39	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.619		0.172	0.183		0.0562	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Actinium-227	0.222	U	0.524	0.524		0.351	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Bismuth-212	0.507	U	1.02	1.02		0.802	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Bismuth-214	0.444		0.128	0.136		0.0513	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Cesium-137	-0.0155	U	0.0758	0.0758	0.0700	0.0613	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Cobalt-60	0.0271	U	0.0485	0.0485	0.200	0.0280	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Lead-210	0.384	U	0.879	0.880		0.653	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Lead-212	0.383		0.0879	0.101		0.0460	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Lead-214	0.310		0.113	0.117		0.109	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Potassium-40	9.93		1.46	1.78		0.227	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Protactinium-231	0.000	U	0.699	0.699		1.86	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Radium-226	0.444		0.128	0.136	0.700	0.0513	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Radium-228	0.619		0.172	0.183		0.0562	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Thallium-208	0.195		0.0602	0.0635		0.0202	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Thorium-228	0.383		0.0879	0.101		0.0460	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Thorium-232	0.619		0.172	0.183		0.0562	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Thorium-234	-0.0799	U	1.21	1.21		0.852	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Uranium-235	0.100	U	0.304	0.304		0.269	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Uranium-238	-0.0799	U	1.21	1.21		0.852	pCi/g	07/11/18 20:43	08/03/18 15:06	1

Client Sample ID: PE2-RSYC7-U12-S002**Lab Sample ID: 160-29416-2**

Date Collected: 07/03/18 13:04

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.795		0.226	0.240		0.0959	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Actinium-227	-0.440	U	1.22	1.22		0.980	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Bismuth-212	0.580	U	1.12	1.12		0.854	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Bismuth-214	0.539		0.195	0.202		0.0761	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Cesium-137	0.0392	U	0.116	0.116	0.0700	0.0918	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Cobalt-60	0.0296	U	0.0241	0.0243	0.200	0.0534	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Lead-210	-0.274	U	2.23	2.23		1.84	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Lead-212	0.694		0.157	0.181		0.0781	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Lead-214	0.692		0.175	0.189		0.0862	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Potassium-40	12.9		2.33	2.67		0.372	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Protactinium-231	-1.36	U	4.57	4.57		3.71	pCi/g	07/11/18 20:43	08/03/18 15:07	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S002

Date Collected: 07/03/18 13:04

Date Received: 07/10/18 08:50

Lab Sample ID: 160-29416-2

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Radium-226	0.539		0.195	0.202	0.700	0.0761	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Radium-228	0.795		0.226	0.240		0.0959	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Thallium-208	0.234		0.0812	0.0847		0.0205	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Thorium-228	0.694		0.157	0.181		0.0781	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Thorium-232	0.795		0.226	0.240		0.0959	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Thorium-234	1.23		1.73	1.73		1.09	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Uranium-235	-0.0661	U	0.129	0.129		0.823	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Uranium-238	1.23		1.73	1.73		1.09	pCi/g	07/11/18 20:43	08/03/18 15:07	1

Client Sample ID: PE2-RSYC7-U12-S003

Date Collected: 07/03/18 13:08

Date Received: 07/10/18 08:50

Lab Sample ID: 160-29416-3

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.517		0.148	0.157		0.0869	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Actinium-227	0.0868	U	0.710	0.710		0.487	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Bismuth-212	0.302	U	0.906	0.907		0.724	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Bismuth-214	0.340		0.103	0.109		0.0413	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Cesium-137	-0.0459	U	0.0550	0.0552	0.0700	0.0623	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Cobalt-60	0.00955	U	0.0345	0.0346	0.200	0.0367	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Lead-210	1.51		1.37	1.38		0.875	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Lead-212	0.531		0.103	0.124		0.0516	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Lead-214	0.514		0.117	0.129		0.0522	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Potassium-40	9.23		1.40	1.69		0.319	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Protactinium-231	0.670	U	1.67	1.67		1.81	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Radium-226	0.340		0.103	0.109	0.700	0.0413	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Radium-228	0.517		0.148	0.157		0.0869	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Thallium-208	0.134		0.0538	0.0556		0.0237	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Thorium-228	0.531		0.103	0.124		0.0516	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Thorium-232	0.517		0.148	0.157		0.0869	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Thorium-234	1.12		1.28	1.29		0.818	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Uranium-235	-0.0420	U	0.347	0.347		0.287	pCi/g	07/11/18 20:43	08/03/18 15:08	1
Uranium-238	1.12		1.28	1.29		0.818	pCi/g	07/11/18 20:43	08/03/18 15:08	1

Client Sample ID: PE2-RSYC7-U12-S004

Date Collected: 07/03/18 13:12

Date Received: 07/10/18 08:50

Lab Sample ID: 160-29416-4

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.684		0.166	0.180		0.0687	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Actinium-227	0.406	U	0.899	0.900		0.721	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Bismuth-212	0.351	U	0.989	0.989		0.781	pCi/g	07/11/18 20:43	08/03/18 15:07	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S004**Lab Sample ID: 160-29416-4**

Date Collected: 07/03/18 13:12

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.576		0.169	0.179		0.0657	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Cesium-137	0.0275	U	0.0720	0.0721	0.0700	0.0564	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Cobalt-60	0.0190	U	0.0597	0.0597	0.200	0.0366	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Lead-210	-1.59	U	2.48	2.49		2.10	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Lead-212	0.566		0.122	0.136		0.0618	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Lead-214	0.554		0.137	0.148		0.0832	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Potassium-40	12.7		1.92	2.31		0.441	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Protactinium-231	0.421	U	1.73	1.73		2.72	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Radium-226	0.576		0.169	0.179	0.700	0.0657	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Radium-228	0.684		0.166	0.180		0.0687	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Thallium-208	0.231		0.0746	0.0782		0.0239	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Thorium-228	0.566		0.122	0.136		0.0618	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Thorium-232	0.684		0.166	0.180		0.0687	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Thorium-234	0.426	U	0.694	0.696		0.890	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Uranium-235	0.196	U	0.480	0.480		0.510	pCi/g	07/11/18 20:43	08/03/18 15:07	1
Uranium-238	0.426	U	0.694	0.696		0.890	pCi/g	07/11/18 20:43	08/03/18 15:07	1

Client Sample ID: PE2-RSYC7-U12-S005**Lab Sample ID: 160-29416-5**

Date Collected: 07/03/18 13:16

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.210		0.224	0.225		0.120	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Actinium-227	-0.310	U	0.761	0.762		0.614	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Bismuth-212	1.22		0.565	0.579		0.185	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Bismuth-214	0.498		0.119	0.129		0.0270	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Cesium-137	-0.0409	U	0.0663	0.0664	0.0700	0.0512	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Cobalt-60	-0.00976	U	0.0534	0.0534	0.200	0.0297	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Lead-210	0.225	U	1.15	1.15		0.927	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Lead-212	0.348		0.0928	0.103		0.0572	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Lead-214	0.467		0.102	0.113		0.0526	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Potassium-40	9.81		1.48	1.79		0.237	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Protactinium-231	0.457	U	1.51	1.51		1.66	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Radium-226	0.498		0.119	0.129	0.700	0.0270	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Radium-228	0.210		0.224	0.225		0.120	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Thallium-208	0.125		0.0904	0.0914		0.0403	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Thorium-228	0.348		0.0928	0.103		0.0572	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Thorium-232	0.210		0.224	0.225		0.120	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Thorium-234	0.233	U	0.913	0.914		0.737	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Uranium-235	0.282		0.194	0.197		0.111	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Uranium-238	0.233	U	0.913	0.914		0.737	pCi/g	07/11/18 20:43	08/03/18 15:43	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S006

Date Collected: 07/03/18 13:20

Date Received: 07/10/18 08:50

Lab Sample ID: 160-29416-6

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.365		0.208	0.212		0.0787	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Actinium-227	0.351	U	0.514	0.515		0.682	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Bismuth-212	1.15		0.604	0.616		0.225	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Bismuth-214	0.407		0.112	0.120		0.0304	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Cesium-137	-0.00332	U	0.0591	0.0591	0.0700	0.0486	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Cobalt-60	0.0395		0.0437	0.0438	0.200	0.0241	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-210	-0.577	U	1.21	1.21		1.37	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-212	0.558		0.106	0.128		0.0472	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-214	0.567		0.116	0.130		0.0424	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Potassium-40	10.6		1.68	2.00		0.274	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Protactinium-231	0.644	U	1.97	1.97		2.16	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Radium-226	0.407		0.112	0.120	0.700	0.0304	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Radium-228	0.365		0.208	0.212		0.0787	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thallium-208	0.217		0.0601	0.0642		0.0158	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-228	0.558		0.106	0.128		0.0472	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-232	0.365		0.208	0.212		0.0787	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-234	2.70		0.988	1.03		0.491	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Uranium-235	0.101	U	0.420	0.420		0.389	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Uranium-238	2.70		0.988	1.03		0.491	pCi/g	07/11/18 20:43	08/03/18 15:45	1

Client Sample ID: PE2-RSYC7-U12-S007

Date Collected: 07/03/18 13:24

Date Received: 07/10/18 08:50

Lab Sample ID: 160-29416-7

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.589		0.146	0.158		0.0504	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Actinium-227	0.325	U	0.720	0.720		0.580	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Bismuth-212	0.000	U	0.508	0.508		0.513	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Bismuth-214	0.599		0.112	0.128		0.0313	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Cesium-137	0.0209	U	0.0540	0.0541	0.0700	0.0428	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Cobalt-60	0.0124	U	0.0556	0.0556	0.200	0.0373	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Lead-210	-0.652	U	1.54	1.55		1.25	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Lead-212	0.428		0.0799	0.0972		0.0377	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Lead-214	0.737		0.111	0.135		0.0420	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Potassium-40	10.1		1.29	1.65		0.246	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Protactinium-231	0.000	U	0.250	0.250		2.02	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Radium-226	0.599		0.112	0.128	0.700	0.0313	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Radium-228	0.589		0.146	0.158		0.0504	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Thallium-208	0.182		0.0490	0.0525		0.0154	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Thorium-228	0.428		0.0799	0.0972		0.0377	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Thorium-232	0.589		0.146	0.158		0.0504	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Thorium-234	0.486	U	0.469	0.471		1.03	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Uranium-235	-0.189	U	0.131	0.133		0.411	pCi/g	07/11/18 20:43	08/03/18 15:43	1
Uranium-238	0.486	U	0.469	0.471		1.03	pCi/g	07/11/18 20:43	08/03/18 15:43	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S008

Date Collected: 07/03/18 13:28

Date Received: 07/10/18 08:50

Lab Sample ID: 160-29416-8

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.790		0.202	0.217		0.0324	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Actinium-227	-0.268	U	0.935	0.935		0.759	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Bismuth-212	0.143	U	0.948	0.948		0.770	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Bismuth-214	0.488		0.164	0.171		0.0732	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Cesium-137	-0.0281	U	0.0870	0.0871	0.0700	0.0483	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Cobalt-60	-0.0125	U	0.0860	0.0860	0.200	0.0419	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-210	0.770	U	1.54	1.54		1.07	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-212	0.571		0.114	0.128		0.0578	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-214	0.717		0.158	0.174		0.0706	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Potassium-40	11.4		1.57	1.95		0.125	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Protactinium-231	0.259	U	1.65	1.65		2.56	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Radium-226	0.488		0.164	0.171	0.700	0.0732	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Radium-228	0.790		0.202	0.217		0.0324	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thallium-208	0.209		0.0665	0.0698		0.0234	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-228	0.571		0.114	0.128		0.0578	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-232	0.790		0.202	0.217		0.0324	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-234	-1.54	U	1.16	1.17		1.56	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Uranium-235	-0.246	U	0.393	0.394		0.545	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Uranium-238	-1.54	U	1.16	1.17		1.56	pCi/g	07/11/18 20:43	08/03/18 15:45	1

Client Sample ID: PE2-RSYC7-U12-S009

Date Collected: 07/03/18 13:32

Date Received: 07/10/18 08:50

Lab Sample ID: 160-29416-9

Matrix: Solid

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.719		0.198	0.211		0.0316	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Actinium-227	0.0566	U	0.624	0.624		0.429	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Bismuth-212	-0.0164	U	1.07	1.07		0.558	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Bismuth-214	0.589		0.151	0.163		0.0565	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Cesium-137	-0.0181	U	0.0626	0.0627	0.0700	0.0499	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Cobalt-60	0.0181	U	0.0324	0.0325	0.200	0.0413	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Lead-210	-0.141	U	1.45	1.45		1.03	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Lead-212	0.465		0.0976	0.115		0.0497	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Lead-214	0.478		0.125	0.134		0.0697	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Potassium-40	11.1		1.58	1.94		0.239	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Protactinium-231	0.271	U	1.33	1.33		2.06	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Radium-226	0.589		0.151	0.163	0.700	0.0565	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Radium-228	0.719		0.198	0.211		0.0316	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Thallium-208	0.181		0.0587	0.0617		0.0203	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Thorium-228	0.465		0.0976	0.115		0.0497	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Thorium-232	0.719		0.198	0.211		0.0316	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Thorium-234	-0.00770	U	1.04	1.04		0.850	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Uranium-235	-0.0136	U	0.311	0.311		0.312	pCi/g	07/11/18 20:43	08/03/18 15:42	1
Uranium-238	-0.00770	U	1.04	1.04		0.850	pCi/g	07/11/18 20:43	08/03/18 15:42	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S010**Lab Sample ID: 160-29416-10**

Date Collected: 07/03/18 13:36

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.512		0.141	0.150		0.0816	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Actinium-227	0.353	U	0.788	0.789		0.632	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Bismuth-212	0.526	U	0.954	0.956		0.740	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Bismuth-214	0.464		0.125	0.134		0.0396	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Cesium-137	0.000	U	0.0257	0.0257	0.0700	0.0604	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Cobalt-60	0.00393	U	0.0674	0.0674	0.200	0.0342	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Lead-210	0.198	U	1.60	1.60		1.30	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Lead-212	0.531		0.110	0.130		0.0545	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Lead-214	0.462		0.102	0.113		0.0223	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Potassium-40	9.30		1.58	1.84		0.238	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Protactinium-231	-0.830	U	2.94	2.94		2.39	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Radium-226	0.464		0.125	0.134	0.700	0.0396	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Radium-228	0.512		0.141	0.150		0.0816	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Thallium-208	0.168		0.0496	0.0526		0.00861	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Thorium-228	0.531		0.110	0.130		0.0545	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Thorium-232	0.512		0.141	0.150		0.0816	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Thorium-234	0.472	U	0.448	0.450		1.15	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Uranium-235	0.159	U	0.529	0.530		0.493	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Uranium-238	0.472	U	0.448	0.450		1.15	pCi/g	07/11/18 20:43	08/03/18 15:44	1

Client Sample ID: PE2-RSYC7-U12-S011**Lab Sample ID: 160-29416-11**

Date Collected: 07/03/18 13:39

Matrix: Solid

Date Received: 07/10/18 08:50

Method: 905.0 - Total Beta Strontium (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Total Beta Strontium	0.0555		0.0617	0.0618	0.331	0.0458	pCi/g	07/16/18 13:23	08/02/18 05:39	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	89.8		40 - 110					07/16/18 13:23	08/02/18 05:39	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.277		0.240	0.242		0.139	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Actinium-227	0.0140	U	0.122	0.122		0.437	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Bismuth-212	0.286	U	0.661	0.661		0.513	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Bismuth-214	0.418		0.128	0.135		0.0535	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Cesium-137	0.0541		0.0370	0.0374	0.0700	0.0203	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Cobalt-60	0.0131	U	0.0235	0.0236	0.200	0.0270	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-210	0.629	U	1.16	1.16		0.829	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-212	0.509		0.0977	0.118		0.0434	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Lead-214	0.467		0.116	0.125		0.0563	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Potassium-40	11.7		1.59	1.99		0.332	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Protactinium-231	0.171	U	1.36	1.36		2.10	pCi/g	07/11/18 20:43	08/03/18 15:45	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S011**Lab Sample ID: 160-29416-11**

Date Collected: 07/03/18 13:39

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Radium-226	0.418		0.128	0.135	0.700	0.0535	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Radium-228	0.277		0.240	0.242		0.139	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thallium-208	0.173		0.0648	0.0673		0.0271	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-228	0.509		0.0977	0.118		0.0434	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-232	0.277		0.240	0.242		0.139	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Thorium-234	0.363 U		1.47	1.47		1.03	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Uranium-235	0.0110 U		0.0461	0.0461		0.327	pCi/g	07/11/18 20:43	08/03/18 15:45	1
Uranium-238	0.363 U		1.47	1.47		1.03	pCi/g	07/11/18 20:43	08/03/18 15:45	1

Client Sample ID: PE2-RSYC7-U12-S012**Lab Sample ID: 160-29416-12**

Date Collected: 07/03/18 13:43

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.637		0.184	0.195		0.0384	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Actinium-227	-0.442 U		1.17	1.17		0.946	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Bismuth-212	0.000 U		0.788	0.788		0.780	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Bismuth-214	0.507		0.151	0.159		0.0545	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Cesium-137	-0.0449 U		0.0908	0.0910	0.0700	0.0711	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Cobalt-60	0.00695 U		0.0882	0.0882	0.200	0.0501	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Lead-210	2.38		1.89	1.91		1.16	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Lead-212	0.452		0.111	0.120		0.0579	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Lead-214	0.706		0.146	0.163		0.0351	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Potassium-40	9.25		1.85	2.08		0.570	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Protactinium-231	0.402 U		1.85	1.85		2.88	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Radium-226	0.507		0.151	0.159	0.700	0.0545	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Radium-228	0.637		0.184	0.195		0.0384	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Thallium-208	0.236		0.0804	0.0839		0.0268	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Thorium-228	0.452		0.111	0.120		0.0579	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Thorium-232	0.637		0.184	0.195		0.0384	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Thorium-234	0.0135 U		1.94	1.94		1.59	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Uranium-235	0.0592 U		0.321	0.321		0.503	pCi/g	07/11/18 20:43	08/03/18 15:44	1
Uranium-238	0.0135 U		1.94	1.94		1.59	pCi/g	07/11/18 20:43	08/03/18 15:44	1

Client Sample ID: PE2-RSYC7-U12-S013**Lab Sample ID: 160-29416-13**

Date Collected: 07/03/18 13:47

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.574		0.326	0.331		0.140	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Actinium-227	-0.0627 U		0.145	0.146		0.526	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Bismuth-212	0.373 U		1.23	1.23		0.986	pCi/g	07/11/18 20:43	08/03/18 16:23	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S013**Lab Sample ID: 160-29416-13**

Date Collected: 07/03/18 13:47

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Bismuth-214	0.599		0.171	0.182		0.0563	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Cesium-137	-0.0320	U	0.106	0.106	0.0700	0.0877	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Cobalt-60	0.0185	U	0.0841	0.0841	0.200	0.0418	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Lead-210	0.994	U	1.56	1.57		1.06	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Lead-212	0.544		0.118	0.137		0.0566	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Lead-214	0.539		0.147	0.157		0.0575	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Potassium-40	9.66		1.77	2.03		0.335	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Protactinium-231	0.000	U	0.432	0.432		2.56	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Radium-226	0.599		0.171	0.182	0.700	0.0563	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Radium-228	0.574		0.326	0.331		0.140	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Thallium-208	0.158		0.0711	0.0729		0.0296	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Thorium-228	0.544		0.118	0.137		0.0566	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Thorium-232	0.574		0.326	0.331		0.140	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Thorium-234	0.754	U	0.460	0.466		0.807	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Uranium-235	0.110	U	0.340	0.340		0.274	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Uranium-238	0.754	U	0.460	0.466		0.807	pCi/g	07/11/18 20:43	08/03/18 16:23	1

Client Sample ID: PE2-RSYC7-U12-S014**Lab Sample ID: 160-29416-14**

Date Collected: 07/03/18 13:51

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.266		0.279	0.280		0.172	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Actinium-227	0.274	U	0.686	0.687		0.552	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Bismuth-212	-0.271	U	0.705	0.706		0.554	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Bismuth-214	0.415		0.139	0.146		0.0518	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Cesium-137	0.0182	U	0.0726	0.0726	0.0700	0.0584	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Cobalt-60	0.00771	U	0.0149	0.0149	0.200	0.0430	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Lead-210	0.0976	U	1.46	1.46		1.20	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Lead-212	0.370		0.0910	0.103		0.0530	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Lead-214	0.409		0.120	0.127		0.0693	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Potassium-40	9.38		1.47	1.76		0.244	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Protactinium-231	0.000	U	0.288	0.288		2.00	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Radium-226	0.415		0.139	0.146	0.700	0.0518	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Radium-228	0.266		0.279	0.280		0.172	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Thallium-208	0.174		0.0880	0.0898		0.0415	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Thorium-228	0.370		0.0910	0.103		0.0530	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Thorium-232	0.266		0.279	0.280		0.172	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Thorium-234	0.143	U	0.275	0.275		0.890	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Uranium-235	-0.137	U	0.288	0.289		0.341	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Uranium-238	0.143	U	0.275	0.275		0.890	pCi/g	07/11/18 20:43	08/03/18 16:24	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S015**Lab Sample ID: 160-29416-15**

Date Collected: 07/03/18 13:54

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.505		0.181	0.189		0.177	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Actinium-227	-0.459	U	1.00	1.01		0.810	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Bismuth-212	0.0111	U	0.883	0.883		0.725	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Bismuth-214	0.654		0.150	0.165		0.0423	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Cesium-137	0.00184	U	0.0668	0.0668	0.0700	0.0544	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Cobalt-60	0.0587		0.0491	0.0494	0.200	0.0242	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Lead-210	-1.03	U	1.44	1.44		1.68	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Lead-212	0.531		0.100	0.121		0.0400	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Lead-214	0.588		0.160	0.171		0.0660	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Potassium-40	9.15		1.57	1.83		0.276	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Protactinium-231	0.482	U	3.11	3.12		2.55	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Radium-226	0.654		0.150	0.165	0.700	0.0423	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Radium-228	0.505		0.181	0.189		0.177	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Thallium-208	0.154		0.0818	0.0834		0.0394	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Thorium-228	0.531		0.100	0.121		0.0400	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Thorium-232	0.505		0.181	0.189		0.177	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Thorium-234	-0.404	U	1.47	1.47		1.23	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Uranium-235	-0.277	U	0.462	0.463		0.482	pCi/g	07/11/18 20:43	08/03/18 16:25	1
Uranium-238	-0.404	U	1.47	1.47		1.23	pCi/g	07/11/18 20:43	08/03/18 16:25	1

Client Sample ID: PE2-RSYC7-U12-S016**Lab Sample ID: 160-29416-16**

Date Collected: 07/03/18 13:58

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.632		0.144	0.157		0.0229	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Actinium-227	-0.354	U	0.742	0.743		0.597	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Bismuth-212	0.000	U	0.220	0.220		0.508	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Bismuth-214	0.539		0.134	0.145		0.0517	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Cesium-137	0.00212	U	0.0587	0.0587	0.0700	0.0482	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Cobalt-60	0.0412		0.0260	0.0263	0.200	0.00897	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Lead-210	0.449	U	1.17	1.17		0.938	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Lead-212	0.502		0.0846	0.107		0.0380	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Lead-214	0.537		0.105	0.119		0.0542	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Potassium-40	10.3		1.30	1.67		0.246	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Protactinium-231	0.610	U	2.33	2.33		1.90	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Radium-226	0.539		0.134	0.145	0.700	0.0517	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Radium-228	0.632		0.144	0.157		0.0229	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Thallium-208	0.176		0.0488	0.0521		0.0155	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Thorium-228	0.502		0.0846	0.107		0.0380	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Thorium-232	0.632		0.144	0.157		0.0229	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Thorium-234	0.564	U	1.21	1.21		0.972	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Uranium-235	0.122	U	0.409	0.409		0.339	pCi/g	07/11/18 20:43	08/03/18 16:24	1
Uranium-238	0.564	U	1.21	1.21		0.972	pCi/g	07/11/18 20:43	08/03/18 16:24	1

Client Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Client Sample ID: PE2-RSYC7-U12-S017**Lab Sample ID: 160-29416-17**

Date Collected: 07/03/18 14:02

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.392		0.168	0.172		0.180	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Actinium-227	-0.339	U	0.956	0.956		0.773	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Bismuth-212	0.242	U	0.708	0.708		0.557	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Bismuth-214	0.599		0.155	0.166		0.0607	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Cesium-137	-0.0476	U	0.0892	0.0893	0.0700	0.0701	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Cobalt-60	0.0278	U	0.0538	0.0539	0.200	0.0301	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Lead-210	1.12	U	1.67	1.68		1.13	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Lead-212	0.559		0.109	0.124		0.0520	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Lead-214	0.490		0.130	0.139		0.0600	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Potassium-40	11.7		1.60	1.99		0.127	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Protactinium-231	0.775	U	2.28	2.28		2.50	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Radium-226	0.599		0.155	0.166	0.700	0.0607	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Radium-228	0.392		0.168	0.172		0.180	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Thallium-208	0.231		0.0766	0.0801		0.0270	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Thorium-228	0.559		0.109	0.124		0.0520	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Thorium-232	0.392		0.168	0.172		0.180	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Thorium-234	-1.53	U	1.24	1.25		1.21	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Uranium-235	-0.250	U	0.603	0.604		0.567	pCi/g	07/11/18 20:43	08/03/18 16:26	1
Uranium-238	-1.53	U	1.24	1.25		1.21	pCi/g	07/11/18 20:43	08/03/18 16:26	1

Client Sample ID: PE2-RSYC7-U12-S018**Lab Sample ID: 160-29416-18**

Date Collected: 07/03/18 14:06

Matrix: Solid

Date Received: 07/10/18 08:50

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.512		0.194	0.201		0.102	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Actinium-227	0.247	U	0.583	0.583		0.390	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Bismuth-212	0.456	U	0.918	0.919		0.717	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Bismuth-214	0.349		0.117	0.122		0.0491	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Cesium-137	0.0188	U	0.0588	0.0588	0.0700	0.0464	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Cobalt-60	0.00261	U	0.0606	0.0606	0.200	0.0311	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Lead-210	1.29		1.54	1.55		0.950	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Lead-212	0.0172	U	0.152	0.152		0.125	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Lead-214	0.532		0.141	0.151		0.0580	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Potassium-40	9.78		1.53	1.83		0.253	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Protactinium-231	0.677	U	1.83	1.83		2.01	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Radium-226	0.349		0.117	0.122	0.700	0.0491	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Radium-228	0.512		0.194	0.201		0.102	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Thallium-208	0.134		0.0554	0.0571		0.0236	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Thorium-228	0.0172	U	0.152	0.152		0.125	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Thorium-232	0.512		0.194	0.201		0.102	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Thorium-234	1.33		1.29	1.29		0.855	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Uranium-235	-0.0526	U	0.104	0.104		0.235	pCi/g	07/11/18 20:43	08/03/18 16:23	1
Uranium-238	1.33		1.29	1.29		0.855	pCi/g	07/11/18 20:43	08/03/18 16:23	1

QC Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Method: 905.0 - Total Beta Strontium (GFPC)

Lab Sample ID: MB 160-375997/22-A

Matrix: Solid

Analysis Batch: 380120

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 375997

Analyte	Result	MB MB U	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Total Beta Strontium	0.02741	U	0.0701	0.0701	0.331	0.0556	pCi/g	07/16/18 13:23	08/03/18 05:52	1
<i>Carrier</i>										
Sr Carrier	90.1			40 - 110				07/16/18 13:23	08/03/18 05:52	1

Lab Sample ID: LCS 160-375997/1-A

Matrix: Solid

Analysis Batch: 379945

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 375997

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	Limits	
				Uncert. (2σ+/-)						
Total Beta Strontium	8.21	8.560		0.685	0.331	0.0493	pCi/g	104	75 - 125	
<i>Carrier</i>										
Sr Carrier	88.9		40 - 110							

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-375044/1-A

Matrix: Solid

Analysis Batch: 380109

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 375044

Analyte	Result	MB MB U	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.03385		0.0956	0.0956		0.0292	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Actinium-227	-0.2446	U	0.528	0.529		0.418	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Bismuth-212	0.0000	U	0.303	0.303		0.590	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Bismuth-214	-0.01197	U	0.0195	0.0195		0.128	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Cesium-137	0.01680	U	0.0374	0.0374	0.0700	0.0282	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Cobalt-60	-0.02772	U	0.0261	0.0263	0.200	0.0390	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Lead-210	0.2354	U	0.956	0.956		0.768	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Lead-212	0.03191	U	0.0681	0.0683		0.0536	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Lead-214	-0.01111	U	0.0632	0.0633		0.0528	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Potassium-40	-0.1175	U	0.686	0.686		0.422	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Protactinium-231	0.5423	U	1.91	1.91		1.55	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Radium-226	-0.01197	U	0.0195	0.0195	0.700	0.128	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Radium-228	0.03385		0.0956	0.0956		0.0292	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Thallium-208	0.01397	U	0.0348	0.0348		0.0299	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Thorium-228	0.03191	U	0.0681	0.0683		0.0536	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Thorium-232	0.03385		0.0956	0.0956		0.0292	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Thorium-234	0.0000	U	0.324	0.324		0.662	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Uranium-235	-0.1235	U	0.229	0.230		0.286	pCi/g	07/11/18 20:43	08/03/18 15:06	1
Uranium-238	0.0000	U	0.324	0.324		0.662	pCi/g	07/11/18 20:43	08/03/18 15:06	1

QC Sample Results

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-375044/2-A

Matrix: Solid

Analysis Batch: 380110

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 375044

Analyte	Spike Added	LCS		Uncert. (2σ+/-)	Total		%Rec.	Limits
		Result	Qual		LOQ	DLC		
Americium-241	96.8	97.92		11.5		0.603	pCi/g	101 87 - 116
Cesium-137	28.2	30.37		3.18	0.0700	0.122	pCi/g	108 87 - 120
Cobalt-60	12.9	13.91		1.45	0.200	0.0878	pCi/g	108 87 - 115

Lab Sample ID: 160-29416-1 DU

Matrix: Solid

Analysis Batch: 380125

Client Sample ID: PE2-RSYC7-U12-S001

Prep Type: Total/NA

Prep Batch: 375044

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	Limit
Actinium 228	0.619		0.5281		0.190		0.0916	pCi/g	0.24	1
Actinium-227	0.222	U	-0.1185	U	0.767		0.475	pCi/g	0.26	1
Bismuth-212	0.507	U	-0.07294	U	1.03		0.839	pCi/g	0.28	1
Bismuth-214	0.444		0.3983		0.141		0.0524	pCi/g	0.17	1
Cesium-137	-0.0155	U	-0.00140	U	0.0523	0.0700	0.0427	pCi/g	0.11	1
Cobalt-60	0.0271	U	0.02356	U	0.0772	0.200	0.0378	pCi/g	0.03	1
Lead-210	0.384	U	-0.5476	U	1.62		1.17	pCi/g	0.37	1
Lead-212	0.383		0.5783		0.135		0.0510	pCi/g	0.83	1
Lead-214	0.310		0.4321		0.136		0.0639	pCi/g	0.48	1
Potassium-40	9.93		10.61		2.07		0.303	pCi/g	0.18	1
Protactinium-231	0.000	U	0.0000	U	0.552		2.26	pCi/g	0	1
Radium-226	0.444		0.3983		0.141	0.700	0.0524	pCi/g	0.17	1
Radium-228	0.619		0.5281		0.190		0.0916	pCi/g	0.24	1
Thallium-208	0.195		0.2093		0.0628		0.00947	pCi/g	0.12	1
Thorium-228	0.383		0.5783		0.135		0.0510	pCi/g	0.83	1
Thorium-232	0.619		0.5281		0.190		0.0916	pCi/g	0.24	1
Thorium-234	-0.0799	U	0.04032	U	1.13		0.927	pCi/g	0.05	1
Uranium-235	0.100	U	0.005505	U	0.0733		0.305	pCi/g	0.25	1
Uranium-238	-0.0799	U	0.04032	U	1.13		0.927	pCi/g	0.05	1

QC Association Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Rad**Leach Batch: 374786**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29416-1	PE2-RSYC7-U12-S001	Total/NA	Solid	Dry and Grind	
160-29416-2	PE2-RSYC7-U12-S002	Total/NA	Solid	Dry and Grind	
160-29416-3	PE2-RSYC7-U12-S003	Total/NA	Solid	Dry and Grind	
160-29416-4	PE2-RSYC7-U12-S004	Total/NA	Solid	Dry and Grind	
160-29416-5	PE2-RSYC7-U12-S005	Total/NA	Solid	Dry and Grind	
160-29416-6	PE2-RSYC7-U12-S006	Total/NA	Solid	Dry and Grind	
160-29416-7	PE2-RSYC7-U12-S007	Total/NA	Solid	Dry and Grind	
160-29416-8	PE2-RSYC7-U12-S008	Total/NA	Solid	Dry and Grind	
160-29416-9	PE2-RSYC7-U12-S009	Total/NA	Solid	Dry and Grind	
160-29416-10	PE2-RSYC7-U12-S010	Total/NA	Solid	Dry and Grind	
160-29416-11	PE2-RSYC7-U12-S011	Total/NA	Solid	Dry and Grind	
160-29416-12	PE2-RSYC7-U12-S012	Total/NA	Solid	Dry and Grind	
160-29416-13	PE2-RSYC7-U12-S013	Total/NA	Solid	Dry and Grind	
160-29416-14	PE2-RSYC7-U12-S014	Total/NA	Solid	Dry and Grind	
160-29416-15	PE2-RSYC7-U12-S015	Total/NA	Solid	Dry and Grind	
160-29416-16	PE2-RSYC7-U12-S016	Total/NA	Solid	Dry and Grind	
160-29416-17	PE2-RSYC7-U12-S017	Total/NA	Solid	Dry and Grind	
160-29416-18	PE2-RSYC7-U12-S018	Total/NA	Solid	Dry and Grind	
160-29416-1 DU	PE2-RSYC7-U12-S001	Total/NA	Solid	Dry and Grind	

Prep Batch: 375044

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29416-1	PE2-RSYC7-U12-S001	Total/NA	Solid	Fill_Geo-21	374786
160-29416-2	PE2-RSYC7-U12-S002	Total/NA	Solid	Fill_Geo-21	374786
160-29416-3	PE2-RSYC7-U12-S003	Total/NA	Solid	Fill_Geo-21	374786
160-29416-4	PE2-RSYC7-U12-S004	Total/NA	Solid	Fill_Geo-21	374786
160-29416-5	PE2-RSYC7-U12-S005	Total/NA	Solid	Fill_Geo-21	374786
160-29416-6	PE2-RSYC7-U12-S006	Total/NA	Solid	Fill_Geo-21	374786
160-29416-7	PE2-RSYC7-U12-S007	Total/NA	Solid	Fill_Geo-21	374786
160-29416-8	PE2-RSYC7-U12-S008	Total/NA	Solid	Fill_Geo-21	374786
160-29416-9	PE2-RSYC7-U12-S009	Total/NA	Solid	Fill_Geo-21	374786
160-29416-10	PE2-RSYC7-U12-S010	Total/NA	Solid	Fill_Geo-21	374786
160-29416-11	PE2-RSYC7-U12-S011	Total/NA	Solid	Fill_Geo-21	374786
160-29416-12	PE2-RSYC7-U12-S012	Total/NA	Solid	Fill_Geo-21	374786
160-29416-13	PE2-RSYC7-U12-S013	Total/NA	Solid	Fill_Geo-21	374786
160-29416-14	PE2-RSYC7-U12-S014	Total/NA	Solid	Fill_Geo-21	374786
160-29416-15	PE2-RSYC7-U12-S015	Total/NA	Solid	Fill_Geo-21	374786
160-29416-16	PE2-RSYC7-U12-S016	Total/NA	Solid	Fill_Geo-21	374786
160-29416-17	PE2-RSYC7-U12-S017	Total/NA	Solid	Fill_Geo-21	374786
160-29416-18	PE2-RSYC7-U12-S018	Total/NA	Solid	Fill_Geo-21	374786
MB 160-375044/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-375044/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-29416-1 DU	PE2-RSYC7-U12-S001	Total/NA	Solid	Fill_Geo-21	374786

Prep Batch: 375997

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-29416-1	PE2-RSYC7-U12-S001	Total/NA	Solid	DPS-0	374786
160-29416-11	PE2-RSYC7-U12-S011	Total/NA	Solid	DPS-0	374786
MB 160-375997/22-A	Method Blank	Total/NA	Solid	DPS-0	
LCS 160-375997/1-A	Lab Control Sample	Total/NA	Solid	DPS-0	

Tracer/Carrier Summary

Client: Aptim Federal Services LLC

Project/Site: Hunters Point Naval Shipyard - Parcel E2

TestAmerica Job ID: 160-29416-2

Method: 905.0 - Total Beta Strontium (GFPC)**Matrix: Solid****Prep Type: Total/NA****Percent Yield (Acceptance Limits)**

Lab Sample ID	Client Sample ID	Sr Carrier (40-110)										
160-29416-1	PE2-RSYC7-U12-S001	88.3										
160-29416-11	PE2-RSYC7-U12-S011	89.8										
LCS 160-375997/1-A	Lab Control Sample	88.9										
MB 160-375997/22-A	Method Blank	90.1										

Tracer/Carrier Legend

Sr Carrier = Sr Carrier

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